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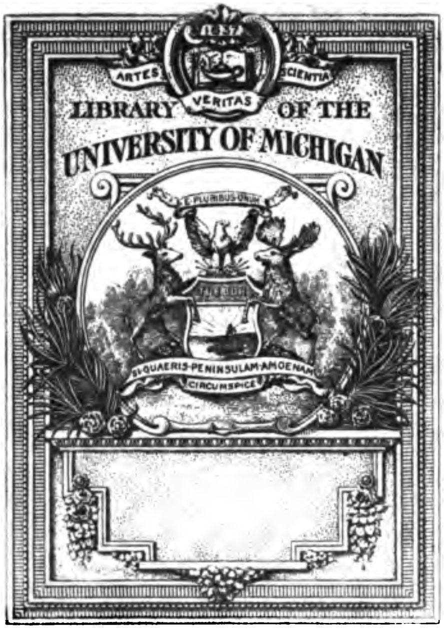
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NOTICE TO BIDDERS

INSTRUCTION TO BIDDERS

CONDENSED SPECIFICATIONS

AND

FORMS OF PROPOSALS

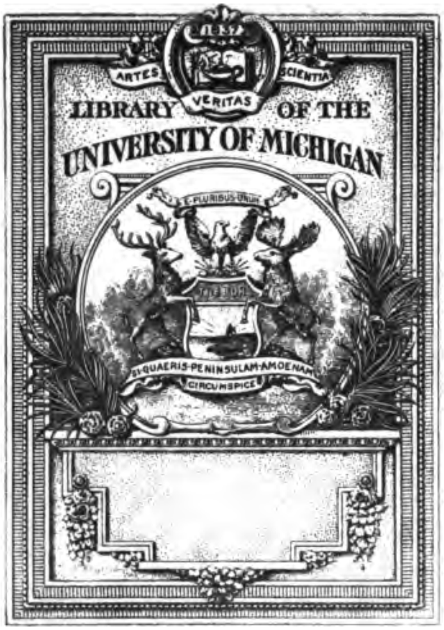
RELATING TO THE CONSTRUCTION
AND OPERATION OF A

MUNICIPAL STREET RAILWAY

FOR THE

CITY OF CHICAGO

PREPARED BY
BION J. ARNOLD
Consulting Engineer
Marquette Bldg.
CHICAGO
JUNE 1, 1905.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PART I.

NOTICE TO BIDDERS.

FOR THE CONSTRUCTION AND OPERATION OF A MUNICIPAL STREET RAILWAY FOR THE CITY OF CHICAGO.

STATE OF ILLINOIS }
COUNTY OF COOK } ss.
CITY OF CHICAGO }

Public notice is hereby given that, pursuant to the resolutions of the City Council of the City of Chicago, duly passed on the thirteenth day of March, 1905 (Council proceedings, p. 3052), proposals will be received for the construction and installation of a system of municipal street railways within the City of Chicago, upon the terms and conditions and the alternative plans hereinafter stated.

FIRST. The said street railway system will first be installed upon the following named streets and parts of streets, to wit:

ADAMS STREET, from Clark street to Desplaines street.

DESPLAINES STREET, from Adams street to Harrison street.

HARRISON STREET, from Desplaines street to Western avenue.

WESTERN AVENUE, from Harrison street to Twelfth street.

TWELFTH STREET, from Western avenue to Crawford avenue.

It will be extended over the following streets and parts of streets, upon which the rights of the present occupants have already expired.

HALSTED STREET, from Harrison street south to the center of the Chicago river.

OGDEN AVENUE, from Harrison street to Fortieth avenue.

And will, at the pleasure of the City Council be extended into any and every other part of the City of Chicago, upon streets in which the rights of the present occupants have already expired or will expire during the years 1905 and 1906, and upon such other streets as may in the discretion of the City Council be deemed advisable for making connected routes and lines of street railways.

SECOND. Payments to be made by the city shall be made either by the delivery of street railway certificates to be issued under and in accordance with the provisions of an act of the General Assembly of Illinois, entitled "An act to authorize cities to acquire, construct, own, operate and lease street railways, and to provide the means therefor," commonly known as the Mueller law, or in cash from the proceeds of the sale of such street railway certificates by the city, and separate bids may be submitted for payment by said certificates or for payment in cash from the proceeds of the sale thereof.

THIRD. Bids shall be separately submitted for the construction of tracks upon the streets specifically named above and for the installation thereon of all the necessary equipment for the operation of street railways. Said bids shall be submitted on the basis of a unit price per mile of track with overhead contact wire equipment, and a unit price per mile of track with underground electric conduit equipment; the construction in either case to be in accordance with the recommendations regarding such classes of construction in the "Report on the Chicago Transportation Problem," by Bion J. Arnold, 1902; the purpose being that the City Council shall hereafter determine what part of the system above referred to shall be equipped with underground and what part with overhead appliances for electric propulsion, and reserves the right to itself furnish and distribute electric power to the system.

FOURTH. Separate bids shall also be submitted for the construction and equipment of the necessary power house or power houses and distributing system and in accordance with plans and specifications to be furnished by the city.

FIFTH. Separate bids shall also be submitted for the furnishing of not less than fifty nor more than three hundred and fifty cars of the double-truck type, not less than forty feet in length over all, cross reversible back seats, center aisle, equipped with 4—30 H. P. motors, air brakes, fenders, sand boxes, and all other devices for the safety and convenience of the traveling public, and separate bids shall also be submitted and based upon a unit price per car for snow plows, sweepers, repair cars, and work cars, to properly take care of the initial system and maintain it in first-class working condition.

SIXTH. Detailed plans and specifications, with regard to all matters hereinbefore referred to will be prepared by the City of Chicago and can be obtained from the Commissioner of Public Works on or after June 1, 1905.

SEVENTH. If bids are submitted upon the basis of payments by means of the delivery of street railway certificates secured in accordance with the provisions of the Mueller law aforesaid, such bids may be separately submitted on the basis that the city shall, itself, operate said system or systems by its own employees, or that the city will lease such system or systems to the highest and best bidder, at least one-half of the rental thus obtained to be and constitute a trust fund to provide additional security for the payment of said street railway certificates and the interest thereon.

EIGHTH. If the bidder or bidders so elect bids may be submitted upon the basis that the completed system when equipped and installed shall be so leased to such bidder, and in such case he shall submit with his bid the percentage of the gross receipts of the system, or the amount of cash per year and the term of years, not to exceed twenty, which shall be provided for in such lease, and in such case the person bidding the highest percentage of gross receipts, other things being equal, shall be considered the best bidder. In case of bids based upon percentages of gross receipts, other things being equal, the bidder who shall accept the lease for the shortest period of time shall be considered the best bidder.

NINTH. If proposals shall be submitted upon the basis of the lease of the system to the bidder, as provided for in paragraph 8 hereof, the lease to be prepared by the authority of the City Council shall be in such form as the City Council may ordain, and shall contain, among other things, the following provisions, in addition to those already expressed herein:

(1) That the operation of cars upon the whole of said system shall at all times be subject to the reasonable exercise of the police power of the city, to be expressed by resolution or ordinance of the City Council or by the orders of such executive officers as the City Council may for that purpose appoint, and that the exercise of the police power, as aforesaid, shall relate to all matters concerning the safety, health, comfort and convenience of the public.

(2) That the rate of fare upon said system shall be five cents for adults and three cents for children between the ages of seven and twelve years, children under seven years of age, if accompanied by an adult, shall be carried free.

(3) That the lessee and operator of said system shall exchange transfers with any other company in the city whose lines cross or come within a distance of two hundred feet of the lines of said lessee and operator, to the extent to which the city may be able to enforce the exchange of said transfers by and with such other companies.

(4) The city shall have the right to commute its compensation by the reduction of fares; provided, however, that such reduction of fares shall never be so exercised as to impair the accumulation of a trust fund for the payment of said street railway certificates at maturity, and interest as the same accrues.

TENTH. Bids may also be submitted for the privilege of constructing and operating street railway tracks and a system of cars in the various streets herein referred to, and such other streets as the city may lawfully designate from time to time, and in such cases the bidder who agrees to pay for such privilege the highest percentage of the gross receipts to be received from such operation for the shortest term, shall, other things being equal, be considered the highest bidder. In such case the bidder may specify the streets and parts of streets upon which he desires to bid.

ELEVENTH. Proposals are also invited by the city for the sale to the city of existing tracks, wires and equipment owned or claimed to be owned by the companies whose ordinance-rights in the streets above mentioned or in any part thereof have expired.

TWELFTH. Possession of the streets specifically above named will not be given by the City of Chicago until after the decision by the Circuit Court of the United States in and for the northern district of Illinois of the injunction suit therein pending, in which is involved the question of the date when the ordinance-rights of the Chicago Passenger Railway Company in the streets above named expire; nor until the date of expiration determined by the final decree in said cause.

THIRTEENTH. All bids will be delivered to the comptroller of the City of Chicago, on or before the first day of July, 1905, in sealed envelopes, with a certified check for $25,000.00, to be forfeited by the successful bidder to the City of Chicago, as liquidated damages, in case the bidder fails to execute the necessary contracts and leases hereinbefore referred to, and to be returned to the respective unsuccessful bidders by the comptroller upon the awarding and execution of the contracts and leases as aforesaid.

FOURTEENTH. At 2 p. m. of the said first day of July, 1905, the comptroller shall open and tabulate said bids and present the same and the tabulated report thereof to the committee on local transportation of the City Council, and said bids and report shall thereafter be forwarded by said committee, upon its recommendations, to the City Council at its next meeting, or as soon thereafter as possible. The City Council will reserve the right to reject all bids or award its contract to the bidder or bidders whose proposal may in the opinion of the City Council be the most advantageous to the interests of the city.

(Signed.) CARTER H. HARRISON,

Mayor of the City of Chicago.

Chicago, March 30, 1905.

PART II.

INSTRUCTION TO BIDDERS.

Proposals are requested from bidders upon the construction of a Municipal Street Railway for the City of Chicago, in whole or in part, as classified in the attached bid sheets, to be built in accordance with the plans and specifications on file in the office of the Commissioner of Public Works in the City Hall at Chicago, a condensed form of which specifications is hereto attached, in order that bidders may determine, without unnecessary annoyance to themselves, the general character of the work.

Proposals are also requested from bidders, who may or may not bid upon the construction of the road, for operating the road in accordance with the provisions contained in the attached "Notice to Bidders," which has been duly published in the public press, each bidder to feel free to formulate such type of proposal as he believes will best comply with the conditions of the advertisement, and with his own ideas regarding a practicable method of leasing and operating the property when built.

All bids to be addressed and delivered in accordance with the terms of clauses thirteen and fourteen of the "Notice to Bidders." Each bid to be sealed and plainly marked on the outside of the envelope "Proposal for the Construction of a Municipal Street Railway for the City of Chicago," or any specific part of the construction or for the operation.

Detailed preliminary plans and specifications will be on file in the office of the Commissioner of Public Works of Chicago on and after June 1st, 1905, and should bidders desire to take these plans and specifications away from the office of the Commissioner of Public Works, complete sets will be supplied upon the deposit with the City Comptroller of a certified check for one thousand dollars ($1,000.) for each complete set, which check will be returned to the maker upon the return of the plans and specifications intact.

All proposals for the construction work shall be made upon bid sheets on the forms hereto attached, extra copies of which may be obtained from the Commissioner of Public Works upon written request.

Bidders shall name the make of each type of apparatus which they propose to furnish and in case of standard types of equipment may name more than one make if they desire.

Bidders shall be prepared to furnish the detailed plans and specifications called for by the City's specifications promptly, upon the request of the Engineer, but need not submit them with their bids.

Maps showing a comprehensive system of tracks that may be built on streets now unoccupied or occupied under franchises which will soon expire are now on file in the office of the Commissioner of Public Works.

Municipal Bonds of the City of Chicago aggregating not less than $25,000.00 may be deposited in lieu of the certified check referred to in Clause Thirteen of the "Notice to Bidders."

The check or bonds of the successful bidder shall be forfeited to the city as liquidated damages in case he fails to qualify by entering into a formal contract for the construction or operation of such work as he bids upon, and the delivery by him to the city of a satisfactory penal bond of an amount equal to one-third of the contract price, and when such a contract has been entered into his check or municipal bonds will be returned to him.

Checks of unsuccessful bidders will be returned immediately after the contract is awarded, and at any rate within ninety (90) days from the date of the opening of the bids.

The right to reject any and all bids is reserved by the City of Chicago.

PART III.

DIGEST OF GENERAL REQUIREMENTS.

I. FORMAL CONTRACT:

It is to be understood by the bidder in making a proposal upon all or part of the work covered by these specifications, that a contract is to be entered into between the successful bidder and the City of Chicago which is to contain articles of agreement, the scope of which is indicated by the following digest of the more complete requirements forming part of the detailed specifications.

II. SCOPE OF SPECIFICATIONS:

The work and material required for furnishing, delivering, erecting and testing in complete and satisfactory working order of a complete Municipal Railway for certain streets of the City of Chicago are set forth in the plans and specifications, which are intended to be complete. All work and material required to make the work complete, whether or not called for in detail by the plans and specifications, is to be furnished by the Contractor.

III. DEFINITION OF TERMS:

The word "Contractor" means the successful bidder. The word "City" means the City of Chicago as represented by a Traction Committee or Commission or some other body or individual duly authorized by the City Council. The word "Engineer" means the engineer duly authorized to take charge of the work.

IV. DIRECTION, EXPLANATION AND CORRESPONDENCE:

All directions to be given by the Engineer or by designated assistant engineers in writing.

V. TEMPORARY WORK:

All temporary work to be furnished by the Contractor at his own cost.

VI. LINES AND LEVELS:

The Engineer will furnish all points and levels. The Contractor is to be held responsible for their loss or disturbance.

VII. WORKMEN:

Only competent foremen and experienced workmen to be employed.

VIII. CONTIGUOUS WORK:

Work to proceed under the direction of the Engineer so as not to delay the progress of contiguous work.

IX. DEFECTIVE WORK AND MATERIAL:

Engineer's acceptance by monthly estimate not to be construed as final acceptance, and Contractor will remove all condemned material at his own expense.

X. REMOVAL OF RUBBISH:

All surplus material, staging, tools and debris to be removed by the Contractor.

XI. CONDITIONS OF STREETS AND HIGHWAYS:

All streets to be left by the Contractor in as good condition as he found them.

XII. INSPECTION:

Material at all times to be open to the inspection, acceptance or rejection of the Engineer.

XIII. MEASUREMENT AND REFERENCE OF DISPUTES:

Disagreements in regard to plans and specifications and the work and material furnished thereunder to be referred to the Engineer, whose interpretation shall be final.

XIV. CHANGES:

Engineer to have power to make alterations and determine the value of the work which is to be added or deducted from the contract price.

XV. EXTRAS:

All extras to be authorized in writing by the Engineer, and the basis of payment to be specifically set forth.

XVI. SUB-LETTING AND TRANSFER OF CONTRACT:

All sub-contracts to have the approval of the Engineer, who is to be furnished with copies of contract if he requests them. No sub-contract to relieve the Contractor of his liability.

XVII. REGULATION AND PERMITS:

Contractor to secure permits as required in accordance with the city ordinances. Contractor to take all necessary precautions for the prevention of accidents.

XVIII. RISK:

Contractor assumes all responsibility for damages from fire, floods, storms, or other causes except negligent acts of the City.

XIX. LABORERS' WAGES:

Contractor to pay for all labor, supplies and material before receiving final payment from the City.

XX. INDEMNITY:

Contractor to indemnify the City against all claims on account of injuries sustained by any party by reason of any act or negligence of the Contractor in the performance of the work.

XXI. INTERFERENCE:

Work is not to interfere with the operation of contiguous railroads or other city work. It is further understood that the City may take possession of any completed portion of the work before the final inspection of the entire work.

XXII. COMMENCEMENT OF WORK:

Work to be commenced within thirty (30) days after date of execution of formal contract, and to be prosecuted in such order as directed by the Engineer.

XXIII. NIGHT AND DAY WORK:

If required by the Engineer, the work is to be carried on night and day in order to complete the same within the contract time.

XXIV. TIME OF COMPLETION.

Work called for by Aggregate Bid No. 1 is to be completed within eighteen (18) months from the date on which the City formally notifies the Contractor in writing that he may proceed with the work, and all other work at such times as may be agreed upon at the time of awarding the contracts for such work.

And whereas, TIME is of the essence of this contract and it might be impossible to compute the amount of loss to the City in case of failure of the Contractor to have the work completed in all its parts on said date, the Contractor agrees to pay the City the sum of One Thousand Dollars ($1,000.) per day for each and every day (Sundays and legal holidays only excepted) after the expiration of said eighteen (18) months, during which the work called for by the contract remains incomplete, not as a penalty but as liquidated damages.

It is understood that in case the failure to complete the work shall be due to any act of the City or to any circumstances absolutely beyond the control of the Contractor: then so much of the delay shall form no part of the number of days for each and every one of which the Contractor is to pay the City the sum of $1,000; PROVIDED, that the Contractor shall give the City notice in writing of the delay.

XXV. TESTS:

Upon completion of the work, the Contractor is to make a series of trial runs extending over a period of not less than two (2) weeks to determine the performance of the individual parts of the installation and report in detail the results of such tests to the Engineer, who is to have the right to verify such results; and the entire work is to be tendered for acceptance only after the trial tests have been made and completed and after defects have been removed to the satisfaction of the Engineer.

XXVI. MONTHLY ESTIMATES:

The Engineer, on or about the first day of every month, is to make an approximate estimate of the proportionate value of the work and material furnished; and the amount of this estimate, after deducting ten per cent (10%), shall be payable to the Contractor on or about the 20th day of the current month.

XXVII. FINAL ESTIMATE:

Upon the final completion and acceptance of the work, the Engineer is to issue a certificate, whereupon the entire balance due the Contractor, including the retained percentage, after deducting any amount due the City, shall be payable to the Contractor within twenty (20) days after date of the final certificate.

XXVIII. PATENTS:

Contractor is to indemnify the City against all losses due to patent litigation, and is to furnish, if desired, proper licenses from the manufacturers of patented equipment.

XXIX. COMPENSATION:

Contractor is to receive as full compensation for all material and labor the prices named in his proposal, which proposal is to be made part of the contract.

XXX. BOND:

The Contractor is to execute a bond of indemnity in an amount equal to one-third of the total contract price.

XXXI. INSURANCE:

Contractor is to insure such parts as are liable to be damaged by fire for the benefit of himself and the City as their interests may appear. The City to assume such insurance and to pay the Contractor the pro rata amount of the premium upon any part of the work at the time of acceptance of any part of said part.

XXXII. ANNULMENT OF CONTRACT:

Should it become necessary to declare the contract void, the Contractor shall thereupon become indebted to the City for liquidated damages in a sum equal to the aggregate of all payments made to him on account of the contract. Upon the annulment of the contract, the Traction Commission shall ascertain the value of all material delivered and work done, including a fair margin of profit, and shall proceed to complete the work according to the contract, using any materials and tools belonging to the Contractor for use in connection with the work. Upon the completion of the work, should the total cost exceed the contract price, the difference shall be charged to the Contractor; should the total cost be less than the contract price, the Contractor shall be entitled to receive the amount found by the Commission above mentioned, less previous payments; PROVIDED, that no allowance is to be made for profit which the Contractor might have made by completing the work or for any excess of the contract price over the total cost of the work.

XXXIII. UNDERSTANDING OF PLANS AND SPECIFICATIONS:

The Contractor, before signing the contract, shall make a careful examination of the contract and the plans and specifications to enable him to thoroughly understand their intention.

PART IV.

LIST OF SPECIFICATIONS AND DRAWINGS.

I. TRACK WORK—GENERAL SPECIFICATIONS:
- *A* Underground Conduit Construction.
- *B* Surface Concrete Beam Construction.
- *C* Surface Tie Construction.
- *D* Track Special Work.
- *E* Adams Street Bridge.

II. PAVING.
- *A* Granite Block.
- *B* Asphalt.
- *C* Brick.
- *D* Creosoted Wood Block.
- *E* Cedar Block.

III. CONDUIT FOR ELECTRIC CABLES:
- *A* Conduit for Railway Feeders.
- *B* Conduit for Transmission Lines.

IV. UNDERGROUND ELECTRIC CABLES:
- *A* Cables for Railway Feeders.
- *B* Cables for Transmission Lines.

V. OVERHEAD WORK:
- *A* Cross Suspension Construction.
- *B* Bracket Suspension.
- *C* Special Work.

VI. SUB-STATION EQUIPMENT—GENERAL SPECIFICATIONS:
- *A* Rotary Converters.

- *B* Air Blast Transformers.
- *C* Blower Set.
- *D* Motor Generator Set.
- *E* Storage Battery.
- *F* Switchboards, Switching Equipment, Wiring.

VII. ROLLING STOCK:

- *A* Passenger Cars.
- *B* Sweeper, Snow Plow and Sprinkler.
- *C* Contact Plow.

VIII. BUILDINGS—GENERAL SPECIFICATIONS:

- *A* Car House and Equipment.
- *B* Repair Shop and Equipment.
- *C* Sub-Station Buildings and Crane.
- *D* Power Plant Building and Switch House, including Crane, Chimney, Breeching and Coal and Ash Handling Equipment.

IX. POWER PLANT EQUIPMENT—GENERAL SPECIFICATIONS:

- *A* Turbo-generators.
- *B* Compound Reciprocating Engines.
- *C* Engine-type Alternators.
- *D* Boilers and Superheaters.
- *E* Stokers or Furnaces.
- *F* Jet Condensers.
- *G* Surface Condensers.
- *H* Turbo-exciter.
- *I* Induction Motor Exciter.
- *J* Exciter Engine.
- *K* Engine-type exciter.
- *L* Boiler Feed Pumps.
- *M* Feed Water Heater.
- *N* Piping.
- *O* Switch Boards and Appurtenances.
- *P* Cable Work.
- *Q* Switch House Equipment for Power Plant.
- *R* Oil Cooled Transformer.

X. TELEPHONE SYSTEM:

- *A* Signal Stations.
- *B* Switchboard.

LIST OF SPECIFICATIONS AND DRAWINGS.

LIST OF DRAWINGS.

1 Ordinary Yoke "A."
2 Handhole Yoke "B."
3 Rails.
4 Slot Rail Splice and Sand Plates.
5 Section through Insulator.
6 Drainage Manhole Covers.
7 Handhole and Feeder Manhole Covers.
8 Paving Plates and Plow Hatch.
9 Bolts and Tie Rods.
10 Excavation Plan.
11 Drainage Manhole.
12 Feeder Manhole.
13 Collapsable Form.
14 Straight Track Plan and Sections.
15 Concrete Beam Construction (Typical Cross Section).
16 Line and Gauge Fastenings.
17 Surface Tie Construction (Typical Cross Section).
18 90° Crossing.
19 40° to 60° Crossing.
20 Contact Plow for Car.
21 Typical Branch-off Curves.
22 Typical Track and Slot Switch.
23 Switch Operating Mechanism.
24 Terminal Manhole.
25 Cross-over.
26 Adams Street Bridge and Viaduct.
27 Feeder Tap Connections.

LIST OF SPECIFICATIONS AND DRAWINGS.

LIST OF DIAGRAMS.

No. I. Power House Wiring.
No. II. Sub-station Wiring.
No. III. Direct Current Supply for Control Switches.
No. IV. Generator Ground Connections.
No. V. Synchronizer Connections.
No. VI. Remote Control Connections, for Feeder Circuits.
No. VII. Conduits and Cables.
No. VIII. Overhead Construction.
No. IX. Electrical Layout at Power Plant.
No. X. Sub-station Layout.
No. XI. Trunk Line, Adams, Harrison and 12th.
No. XII. Trunk Line, with Branches; Halsted and Ogden.
No. XIII. Track Special Work.
No. XIV. Track Special Work.
No. XV. Track Special Work.
No. XVI. Track Special Work.
No. XVII. Track Special Work.
No. XVIII. Track Special Work.
No. XIX. Track Special Work.
No. XX. Track Special Work.
No. XXI. Track Special Work.
No. XXII. Track Special Work.
No. XXIII. Track Special Work.
No. XXIV. General Arrangement of Repair Shops.
No. XXV. General Arrangement of Car House.
No. XXVI. Cross Section of Car House.

PART V.

DIGEST OF SPECIFICATIONS.

The following Digest has been prepared to show briefly the requirements of the Preliminary Plans and Specifications, comprising some 300 pages, on file in the office of the Commissioner of Public Works, and which can be obtained in accordance with the "Instruction to Bidders."

DIGEST OF SECTION I.

GENERAL SPECIFICATIONS FOR TRACK CONSTRUCTION.

I. SCOPE OF SPECIFICATIONS:

Specifications and drawings for three types of track construction are submitted for bids, to-wit:

(A) Underground conduit construction.

(B) Surface concrete beam construction.

(C) Surface tie construction. The location and extent of each type is set forth in the respective specifications, upon Diagrams No. XI and XII and upon the aggregate bid sheets.

(D) Track special work.

(E) Adams street bridge.

II. PERSONAL EXAMINATION:

Bidder must satisfy himself by personal examination of the location of the proposed work, or by such other means as he may prefer as to the accuracy of the described conditions contained in the specifications and of any estimates of quantities, or correctness of bills of materials submitted.

III. PRESENT CONDITION OF STREETS:

Bidder will make his proposition upon the assumption that all of the old track material will be removed from the streets by other parties, and that the space formerly occupied by the car tracks will be filled and temporarily paved.

IV. TRACK CENTERS:

Bidder will base his proposition upon the assumption that the tracks will be spaced 10 ft. center to center.

V. USE OF FIRE HYDRANTS:

Contractors desiring to use water from public hydrants must make application for such privilege to the City Water Department.

VI. TEMPORARY BRIDGES:

The Contractor must construct and maintain suitable temporary foot bridges and temporary wooden crossings for all openings at street intersections.

VII. CLEANING STREETS:

All surplus dirt and material must be removed from the streets as rapidly as the work of track laying is completed, and where concrete work is done the streets must be cleaned to receive the concrete material.

VIII. RAILS:

1. The rails are to be of the girder type, either groove rail, guard rail, or plain girder rail, as specified in each track sub-specification.

2. The detail specification gives the requirements under the following headings: Section, Lengths, Finish, Drilling, Branding, Chemical Composition, Tests, Treatment of Ingots, Cutting of Blooms, Heating and Inspection.

IX. JOINTS:

1. *Cast Welded Joints.* The rails at joints must be thoroughly cleaned, either by sand blast or other effective operation satisfactory to the Engineer. Suitable device must be applied to prevent the rail ends from raising. Raised joints will be condemned. The mixture of iron used will be 50% machinery scrap and 50% best quality soft pig iron.

Men experienced in placing cast welded joints must be employed.

The Contractor must furnish temporary splices and bolts for use in laying the track.

The Contractor must guarantee the joints and renew them at his own expense during the first year after the completion of the work.

2. *Electrically Welded Joints.* The rails at joints must be thoroughly cleaned by sand blast or other effective operation satisfactory to the Engineer.

The welded joint is to consist of Bessemer steel bars, one on each side, 1″ thick, 3½″ wide and 20″ long, and of a length sufficient to reach beyond the joint plate holes, electrically welded to the web of the rail at three points.

Openings at the joints are to be filled with a piece of the same section as the rail in the track.

Contractor to furnish all labor, material and apparatus.

The Contractor will furnish the necessary electric current for operating the welding apparatus.

The Contractor must furnish temporary splices and bolts for use in laying the track.

The Contractor must guarantee the joints and renew them at his own expense during the first year after the completion of the work.

3. *Thermit Joints.* Rails at joints must be thoroughly cleaned from all dirt.

Contractor to furnish molds, material and appliances, including magnesia (or other acceptable material) lined crucible, properly arranged to control the materials and to insure the best results.

The rail ends must be heated by means of a blow torch just before the weld is made.

Contractor must furnish temporary splices and bolts for use in laying the track.

The Contractor must guarantee the joints and renew them at his own expense during the first year after the completion of the work.

4. *Bolted Joints.* Bolted joints must be some type of a four-bolt "bridge" joint, similar to the Weber joint, the "Continuous" joint or the Atlas joint, 24″ long, and manufactured so as to "fish" accurately with the rail. Price of joint must include the bonding of the joint with two 8″ 4/0 copper bonds with 7/8″ solid terminals. The bond holes must be drilled in the field.

X. CONCRETE:

1. *Mixture.* The concrete will consist of Portland cement one part, crushed stone six parts, and sand three parts.

2. *Portland Cement.* The specification gives the requirements under the following headings: Fineness, Time of Setting, Tensile Strength Neat, Checking, Boiling, Specific Gravity, Weight, Condition and Storage.

3. *Stone.* The stone shall be hard, durable, free from dirt, broken and screened so as not to measure more than 2″ and not less than 1″ in any dimension. The stone when delivered upon the street must be deposited upon flooring and kept clean.

4. *Sand.* The sand used shall be clean, dry, free from dust, loam and dirt, the sizes ranging from 1/8″ down to the finest, and when delivered upon the street must be deposited upon planking and kept clean.

5. *Mixing by Hand.* Tight platforms shall be provided to accommodate men and materials for progressive and rapid mixing of the batches of concrete. Batches shall not exceed one cubic yard each, and smaller batches are preferable.

Spread the sand evenly upon the platform, then the cement upon the sand and mix thoroughly. Add sufficient water to make a mortar. Then add the broken stone, previously wet down if necessary. Turn the mass with shovels until thoroughly incorporated, and all stone is covered with mortar.

6. *Mixing by Machine.* The Contractor may use a machine mixer at the discretion of the Engineer in charge.

7. *Time.* The concrete shall be placed immediately after mixing. Any having an initial set shall be rejected.

DIGEST OF SECTION I.—A.

SPECIFICATION FOR UNDERGROUND CONDUIT CONSTRUCTION.

I. GENERAL:

This specification covers UNDERGROUND CONDUIT CONSTRUCTION for double track.

II. DESCRIPTION:

The track will be built with 9" girder groove side rails, 7" Z bar slot rails, cast iron yokes spaced 5 ft. center to center, T iron conductor rails supported every 15 ft. by porcelain insulators. Every 105 ft. a drainage and cleaning manhole will be built. Every fourth manhole will be a feeder manhole.

III. LOCATION:

Tracks to be built under this specification will be built from Clark street to Ogden avenue, and on Halsted street to the South branch of the Chicago river. See Diagrams No. XI and XII.

IV. YOKES:

Two types of cast iron yokes, spaced 5 ft. center to center, will be used to form and reinforce the concrete conduit.

(1) Ordinary Yoke "A," Drawing No. 1.
(2) Handhole Yoke "B," Drawing No. 2.

V. SIDE RAIL:

To be of the girder groove type, nine inches in depth, to weigh 120 pounds per yard in 50' lengths; to be in section as shown upon Drawing No. 3 and to be manufactured as specified in general track specifications.

VI. SLOT RAIL:

To be a rolled steel Z bar weighing 57 pounds per yard, as shown upon Drawing No. 3.

Slot rail splices to be as shown upon Drawing No. 4.

Tie rods, spaced 2'-6" centers, as shown upon Drawing No. 9.

VII. CONDUCTOR RAIL:

To be a standard "T" section weighing 21 pounds per yard as shown upon Drawing No. 3 and will be supported every 15 ft. by porcelain insulators suspended from the slot rail in the handhole yokes as shown upon Drawing No. 5.

VIII. CAST IRON FRAMES AND COVERS:

Cast iron frames with covers will be furnished, two for each handhole yoke and two for each drainage manhole. Plow hatch frames and covers will be 8 per mile of double track, Drawings Nos. 6, 7, 8.

IX. SAND PLATES:

Sand plates closing the space between the bottom of the slot rail and the concrete will be furnished of different lengths as shown upon Drawing No. 4.

X. PAVING PLATES:

Wrought iron paving plates reinforced with angle irons will carry paving and street traffic over drainage manholes.

XI. BOLTS:

Drawing No. 9 shows various bolts required for conduit track construction.

XII. EXCAVATION:

The Contractor will excavate a trench for each track to the proper widths and depths as shown upon Drawing No. 10. Every 105 ft. he will excavate a drainage manhole, as shown upon Drawing No. 11. Every 420 feet he will substitute a feeder manhole, as shown upon Drawing No. 12.

XIII. TRACK LAYING:

After excavating the trenches, the yokes, slot rail and side rail will be placed and bolted. The side rails will be lined to gage by shims. The side rail joints to be temporarily spliced with splices furnished by Contractor, the track carefully surfaced, lined and braced.

XIV. PLACING CONCRETE:

Collapsible wooden forms will be used, wedged out to conform accurately to the conduit opening in the yoke, as shown upon Drawing No. 13. The concrete will be placed as shown in longitudinal section and cross section upon Drawing No. 14. Contractor will furnish necessary form lumber to build the concrete manhole walls as shown upon Drawings No. 11 and 12.

XV. LINING SLOT AND SIDE RAILS:

After the concrete has been placed the side rails will be relined and gaged, the tie rods placed and slot accurately lined.

XVI. PLACING CONDUCTOR RAILS:

After lining the slot rail, the conductor rail and insulators will be bolted in place and each joint bonded with two 2/0 copper bonds.

XVII. CAST WELDED JOINTS:

Cast welded joints for side rails will weigh 200 pounds each.

XVIII. TERMINAL MANHOLE:

At points where the working conductor changes from underground to overhead a manhole, as per Drawing No. 24, will be built, equipped with hatch holes, movable insulated section of conductor rail, and a 500 ampere switch placed in the circuit feeding the movable conductor rail.

DIGEST OF SECTION I.—B.

SPECIFICATION FOR SURFACE CONCRETE BEAM CONSTRUCTION.

I. GENERAL:

This specification covers SURFACE CONCRETE BEAM CONSTRUCTION for double track.

II. DESCRIPTION:

The track to be built under this specification is shown in cross section upon Drawing No. 15 and will consist of 9″ girder rails carried on concrete beams, bolted and braced as shown.

III. LOCATION:

The location of the work to be done under this specification will be on Harrison street from Ogden avenue to Western avenue; Western avenue to Twelfth street; Twelfth street to Rockwell street, and on Ogden avenue from Harrison street to Albany avenue.

IV. RAIL:

To be of the girder groove type, nine inches in depth, to weigh 120 pounds per yard in 50′ lengths; to be in section as shown upon Drawing No. 3 and to be manufactured as specified in general track specifications.

V. RAIL JOINTS:

Cast welded joints will weigh 200 pounds each.

VI. LINE AND GAGE FASTENINGS:

The rails will be held to line and gage by bolts, plates and malleable iron braces as shown upon Drawing No. 16 spaced 5 ft. center to center, requiring 4224 sets per miles of double track.

VII. CONCRETE:

Under each rail will be constructed a Portland cement concrete beam 12″ deep, sloped to a connection with a 6″ concrete foundation under the paving, as shown on Drawing No. 16; the concrete beam and paving foundation to be placed at the same time and to form a monolithic bed.

VIII. EXCAVATION:

The Contractor will excavate to a depth of 12″ below the top of the rail for brick pavement, 12″ for granite block pavement, 11 inches for creosoted wood pavement and 9½″ for asphalt pavement; a width of 9′-6″ each side of the center between tracks. Under each rail a trench will be dug for the concrete beam to dimensions shown upon Drawing No. 16.

IX. TRACK LAYING:

Rails will be temporarily spliced, brought to line and gage by temporary ties, spaced ten to fifteen feet centers, both to be removed as the work progresses. The line and gage fastenings placed upon rail five feet center to center, the track lined, surfaced and securely braced and the concrete put in place.

The clearance left in concrete about rail, as well as the void, will be filled with natural cement concrete proportioned as follows:

1 part natural cement and six parts of washed gravel, or 1 part natural cement and four parts torpedo sand.

DIGEST OF SECTION I.—C.

SPECIFICATION FOR SURFACE TIE CONSTRUCTION.

I. GENERAL:

This specification covers SURFACE TIE CONSTRUCTION for double track.

II. DESCRIPTION:

The track to be built under this specification is shown in cross section upon Drawing No. 17 and will consist of 7″ girder rails spiked to ties.

III. LOCATION:

The location of the work to be done under this specification will be on Twelfth Street from Rockwell Street to 40th Avenue, and upon Ogden Avenue from Albany Avenue to 40th Avenue.

IV. RAILS:

The rails will be of the girder type, 7″ in depth, weighing not less than 85 pounds per yard; to be in 60 ft. lengths, and to be manufactured as specified in General Track Specifications.

V. RAIL JOINTS:

Cast welded joints will weigh 120 pounds.

VI. TIE PLATES:

Ordinary tie plates will be used upon every other tie. Malleable tie plates will be used upon the balance, as shown upon Drawing No. 17.

VII. SPIKES:

5½″ x 9/16″ railroad spikes will be used, four to each tie.

VIII. TIES:

Ties will be of first quality standard railroad ties, either white or burr oak, cedar or hemlock, 6″x8″x8′, 2,640 to the mile of single track.

IX. EXCAVATION:

The street will be excavated to the uniform depth of 7″ below the grade of the top of the rail, 9′ 6″ each side of the center between tracks.

Tie holes will be dug, spaced as directed by the Engineer, to a depth of 16″ below the established grade of the top of the rail.

X. TRACK LAYING:

Ties will be laid to a line and line rail spiked to the ties to a line. The rails will be spliced with temporary splices furnished by the Contractor, to be removed when the cast welded joints are placed, after the track has been spiked, surfaced, lined and back-filled.

The track will be back-filled with dirt to the top of the tie.

XI. CROSS BONDING:

Every thousand feet, and upon each side of each special lay-out, the four rails will be connected by two 4/0 copper cross bonds, and at special lay-outs an independent copper conductor of 350,000 c. m. cross section area will be connected to the cross bonds and extend the entire length of the special work.

DIGEST OF SECTION I.—D.

SPECIFICATION FOR TRACK SPECIAL WORK.

I. GENERAL:

This specification covers TRACK SPECIAL WORK for double track.

II. CHARACTER:

All special work will be "Renewable Hard Center" construction; gage 4′-8½″.

III. SURVEYS:

The special work manufacturer must make his own survey and take his own measurements from which his detailed drawings will be made for each separate layout. The finished work must be true to gage and angle, in perfect alignment within itself, and must line up accurately with the connecting tracks.

IV. WORKING PLANS:

A working plan must be furnished with each layout giving over-all dimensions, angles, etc., and showing the lengths of each piece and its number, and show the reference points to which the survey is tied.

V. RAILS:

All conduit construction track special work will be built with 7″ girder guard rail weighing 120 pounds per yard. General drawings will be on file showing conduit track special work. On tangents the guard rail will be planed off level with the tread of the rail so that the finished work will present an even surface to the street.

All 9″ concrete beam track special work not involving conduit construction will be constructed with 120 pound girder groove rail on tangents, and 130 pound girder guard rail on curves.

All 7″ rail tie construction track special work will be built with 7″ girder guard rail weighing not less than 100 pounds per yard. On tangents the guard will be planed off level with the tread of the rail so that the finished work will present an even surface to the street.

The Contractor will furnish all special and combination splice bars with bolts required for the joints in each layout.

All underground conduit ordinary straight track construction will be built with the side rail ¾ inch below the top of the slot rail as shown upon Drawings No. 1 and 2.

All underground conduit special work will be built with the top of the slot rail and the tread of the side rail level as shown upon Drawing No. 19 and the special work manufacturer will be governed accordingly and will provide in his work for this change.

DIGEST OF SECTION I.—E.

SPECIFICATION FOR RECONSTRUCTION OF ADAMS STREET BRIDGE AND VIADUCT.

I. GENERAL:

This specification covers the RECONSTRUCTION OF ADAMS STREET BRIDGE AND VIADUCT.

II. DESCRIPTION:

The Adams street bridge and viaduct embraces a short I beam approach on the east side, a pin connected three truss draw span, a deck plate girder span, a pin connected three truss fixed span, and an I beam approach span on the west side, covering a total distance of 499′8″.

The work to be performed embraces the reconstruction of the old floor beams and stringers in such a manner as to permit the addition of the new track rails and underground conduit construction.

III. APPROACHES:

The east and west approaches, 18 feet and 26 feet long, respectively, consisting of I beams and brick arches, will be reconstructed by the removal of two (2) arches and substituting stiffened plates carrying angle iron yokes and concrete filling.

IV. DRAW SPAN:

The draw span, 259′8″ over all, shall be reconstructed; the intermediate floor beams removed, reconstructed and lowered and the stringers lengthened to a bearing on the top flanges of the floor beams. New stringers will be provided, consisting of two webs and four angles, to which will be bolted 6″x6″x⅜″ lug angles, 5 ft. center to center, to carry the slot rail. Every 15 feet insulators will be bolted to the slot rail to carry conductor bars.

The end floor beams shall be removed and a box girder beam, curved to the proper radius, and adapted to clear the end rollers of the bridge, substituted.

The outer floor beam of the drum shall be removed and reconstructed. New connection provided for the stringer under the rail next to the truss and conduit satisfactorily connected. The inner floor beam of the drum shall be removed and reconstructed to support the stringers as provided in Specification I-E.

V. WEST APPROACH:

The pin span of the west approach, 156′6″ long, shall have its floor beams removed, reconstructed and lowered, and the stringers lengthened to a bearing on the floor beams. Two stringers will be removed from the present location directly under the rails and new stringers substituted, carrying the slot rails, conductors and insulators, the same as provided for the draw span.

The deck girder span, 39′6″ long, shall be reconstructed in the same manner as the pin span, the gusset plates and connection angles between floor beams and girders, or posts, to be cut off and replaced with new gusset plates and connection angles.

All as shown upon Drawing No. 26, and Specification I-E.

VI. RAILS:

The rails on the east and west approaches shall be 7″ in depth and on the draw, pin connected and girder spans 9″ in depth.

VII. ALTERNATIVE DESIGN:

Bidders may submit alternative design of reconstruction.

DIGEST OF SECTION II.—A.

SPECIFICATION FOR GRANITE BLOCK PAVING.

I. GENERAL:

This specification covers GRANITE BLOCK PAVING.

II. SAND CUSHION:

Upon the concrete paving foundation left as provided for in Specification No. I-A or I-B shall be spread two inches (2″) of sand, to be surfaced with guides and templates as directed by the Engineer.

III. GRANITE BLOCK:

Upon the sand cushion shall be set syenite or granite paving blocks from 3½″ to 4″ in width, 8″ to 10″ in length and 4″ in depth.

Blocks laid in uniform courses; space between blocks from ⅛″ to ⅜″ in width. Courses to be of same depth and joints broken by at least 3″. Spaces filled to within 2″ of the top of the block with dry gravel, and the blocks rammed to a true surface and firm bed with a 75 pound rammer. After ramming, the spaces between the blocks are to be filled with paving pitch of approved quality and temperature, two gallons to each square yard of pavement. While the paving pitch is still hot the blocks shall be covered ¾″ deep with dry, clean, washed, heated roofing gravel. The tarring and top dressing must be completed each day to within five feet (5′) of the face of the block.

DIGEST OF SECTION II.—B.

SPECIFICATION FOR ASPHALT PAVING.

I. GENERAL:

This specification covers ASPHALT PAVING.

II. ASPHALTIC CEMENT:

The asphaltic cement shall be made of refined Trinidad asphalt, or of an asphalt of equal quality mixed with heavy petroleum oil in the proper proportions.

III. BINDER COURSE:

Upon the concrete paving foundation as provided for in Specification I-A and I-B shall be laid a binder course, composed of "small concrete" broken limestone and asphaltic cement, one cubic yard of stone to 15 gallons of cement, thoroughly mixed, spread while in a hot and plastic condition, and rolled with a five ton steam roller to uniform thickness of 1½″.

Burned or chilled binder to be rejected.

IV. WEARING SURFACE:

The wearing surface will be composed of 17 parts asphaltic cement, 73 parts sand, 10 parts pulverized carbonate of lime, mixed at a temperature of 300° F. to a perfect mixture.

The mixture to be spread at a temperature not less than 250° F. by hot iron rakes, and compressed to a thickness of 2″ by rollers, then swept with hydraulic cement and rolled with a 15 ton steam roller.

DIGEST OF SECTION II.—C.

SPECIFICATION FOR BRICK PAVING.

I. GENERAL:

This specification covers BRICK PAVING.

II. SAND CUSHION:

Upon the concrete paving foundation left as provided for in Specification No. I-A or I-B shall be spread two inches (2″) of sand, to be surfaced with guides and templates as directed by the Engineer.

III. WEARING SURFACE:

Brick shall be placed upon the sand as hereafter specified.

IV. QUALITY OF BRICK:

1. The brick shall be re-pressed vitrified paving brick, 8″ in length, 4″ in depth, and 2½″ in thickness, edges rounded to a radius of ¼″, free from lime or other impurities, annealed to the ultimate degree of toughness and vitrified so as to make an homogeneous mass.

2. Specimen brick must be furnished for "water absorption" test, "abrasion" test and "specific gravity" test.

3. Bricks are to be laid on edge, close together, joints broken not less than 3″. Half bricks may be used for starting and closing courses.

4. Bricks shall be rolled with a five ton roller, or may be rammed with a 30 pound rammer, at the discretion of the Engineer.

5. After rolling, broken brick must be replaced with perfect brick.

V. PITCH FILLER:

The joints or spaces between bricks to be filled with hot pitch as specified.

VI. CEMENT GROUT FILLER AND TOP DRESSING:

Cement grout filler shall be composed of one part each of sand and Portland cement, mixed with water to the consistency of cream, immediately applied and thoroughly swept into the joints.

Grout or filler shall be applied in two or more courses. The surface of the pavement to be top-dressed with ½″ of sand.

DIGEST OF SECTION II.—D.

SPECIFICATION FOR CREOSOTED WOOD BLOCK PAVING.

I. GENERAL:

This specification covers CREOSOTED WOOD BLOCK PAVING.

II. SAND CUSHION:

Upon the concrete paving foundation left as provided for in Specification No. I-A or I-B shall be spread one inch (1″) of sand, to be surfaced with guides and templates as directed by the Engineer.

III. WEARING SURFACE:

Upon the sand shall be placed southern long leaf yellow pine blocks

4″ in depth, 4″ in width, not less than 5″ nor more than 10″ in length, with the fiber of the wood running in the direction of the depth; to be sound, square edge, free from defects that will impair their life or the laying of them. The blocks shall be treated with Kredone-Creosote wood preserving oil, sixteen (16) pounds to the cubic foot of timber. Blocks shall be laid in parallel courses, breaking joints alternately, driven tightly together with spaces at intervals of 100 ft., one-half inch (½″) in width, filled with bituminous cement for expansion. Blocks firmly bedded in the sand to a uniform contour and rolled with five ton asphalt roller. Joints filled with bituminous cement or pitch, of quality and character to conform to the solvent, temperature and method of application clauses contained in specifications.

While the paving cement is still hot it shall be covered to a depth of ¼″ with dry torpedo sand.

Grouting and top dressing must be completed each day to within 25 ft. of the face of the blocking.

Cementing or top-dressing upon wet blocks may be condemned by the Engineer.

IV. HEADERS:

At the end of the work, or where necessary, there shall be placed a "header" constructed of 3″ x 12″ oak plank, supported by 6″ split cedar posts, three feet in length, set five feet apart.

DIGEST OF SECTION II.—E.

SPECIFICATION FOR CEDAR BLOCK PAVING.

I. GENERAL:

This specification covers CEDAR BLOCK PAVING.

This specification contemplates the use of cedar block paving in connection with the construction of 7″ girder rail track only, as shown on Drawing No. 17.

II. PAVING:

Upon sub-grade left as provided for in Track Specifications No. I-C, the Contractor must level paving bed with sand, crowned in the center between tracks. 2″ hemlock planks shall be laid lengthwise of the track, breaking joints on ties in the "horse-path" and on 1″ x 8″ sound pine stringers in the center between tracks, all to be firmly bedded throughout and cracks between the planks filled with sand. 5″ perfectly sound live cedar blocks from 4″ to 8″ in diameter must be laid squarely on their ends, well driven together, with interstices between the blocks from ¾″ to 1½″.

The surface of the pavement must be true and uniform.

The Contractor shall furnish necessary help to inspect blocks and must remove immediately from the street blocks rejected by the Engineer. Clean screened dry gravel from ½″ to 1½″ in size, shall be thoroughly rammed into the interstices with proper tools, striking each interstice three full blows. After ramming the blocks will be covered with pitch of the quality and temperature specified and the pitch immediately covered to a depth of ¾″ with clean, washed, dried and heated roofing gravel or screened gravel.

Pavement top dressed upon wet blocks may be condemned at the discretion of the Engineer.

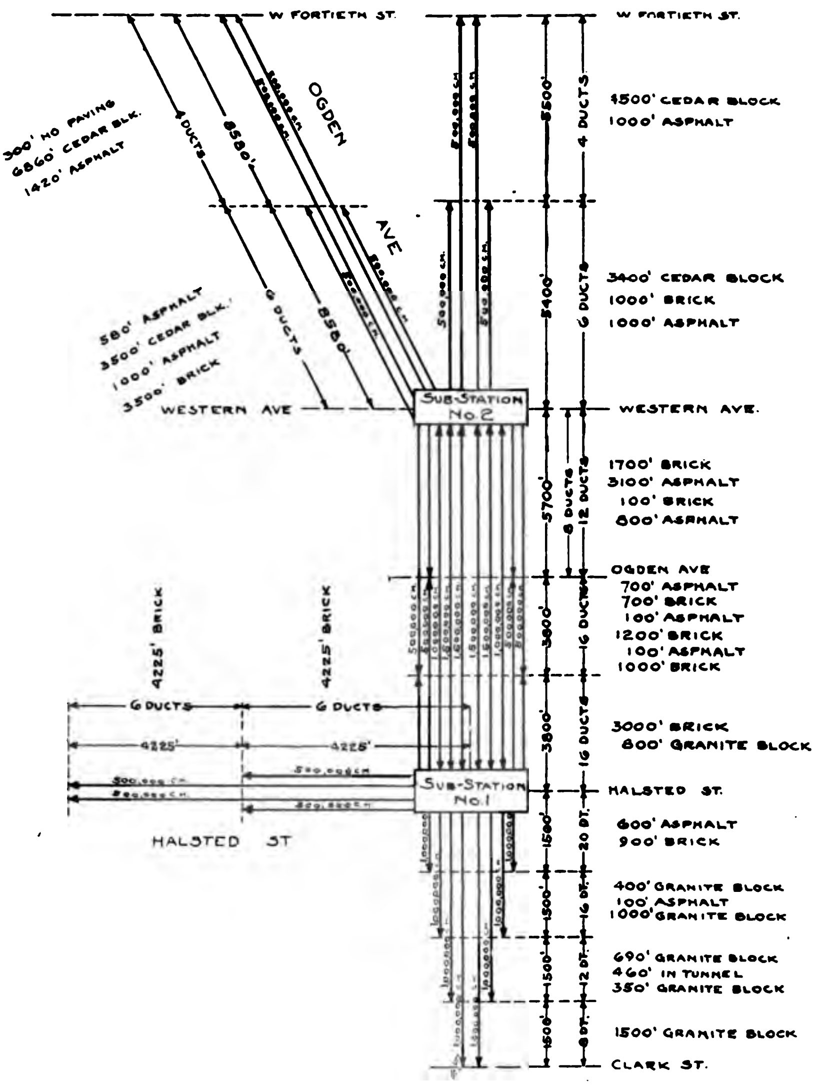


Diagram No. VII

Conduit and Cables

DIGEST OF SECTION III.

SPECIFICATION FOR CONDUITS FOR ELECTRIC CABLES.

I. GENERAL:

This specification covers the delivering and placing of the CONDUITS FOR ELECTRIC CABLES.

II. LOCATION:

1. At side of car tracks. See typical cross-section, Drawings No. 14 and 15.
2. Under pavement as per Diagram No. VII.

III. MATERIAL:

1. Samples to be furnished for approval.
2. Single ducts 3½" bore of vitrified clay.
3. Bends and split ducts.
4. Mandrels for alignment to be submitted.
5. Cement, Sand, Broken Stone and Concrete to be as per specifications under Track Construction.

IV. EXCAVATION:

1. Made according to locations and dimensions furnished by the Engineer.
2. Not to damage water pipes, gas pipes, cables or conduits found in street.

V. LAYING DUCT:

1. 3" bed of concrete.
2. Ducts in perfect alignment by use of approved mandrels.
3. No joints in adjacent ducts nearer than three inches.
4. Laterals—for trolley taps and telephone taps.
5. Concrete casing of 3" sides and top.
6. Planking top and sides.
7. Refilling and removal of debris.
8. Split tile to be laid enclosing cables after same are in place.

VI. MANHOLES:

1. Only manholes for surface section included.
2. Typical manhole. See Drawing No. 15.
3. Constructed of concrete in sizes shown.
4. Molds furnished by Contractor.
5. Sewer connections as specified.

VII. RODDING AND CLEANING:

1. All ducts in each section shall be rodded upon completion.
2. Approved mandrel and steel brush to be drawn through each duct.
3. No. 12 B. W. G. galvanized wire to be left in each duct.

DIGEST OF SECTION IV.

SPECIFICATION FOR UNDERGROUND ELECTRIC CABLES.

I. GENERAL:

This specification covers the delivering, installing and testing of the UNDERGROUND ELECTRIC CABLES.

II. TYPE AND SIZE:

A. Railway circuit single conductor cables for 650 volt d. c. current, 500,000 c. m., 1,000,000 c. m. and 1,500,000 c. m.

B. Transmission circuit three conductor cables for 22,000 volt a. c. current No. 1/0 and No. 2/0.

III. INSULATION:

1. Paper or cambric treated with compound.
2. Insulation to stand continuous load of one ampere per thousand circular mils.
3. Cables to be capable of being coiled ten times around test cylinder, 15 times the diameter of cable, without injury.
4. 650 volt cable to have insulation 4/32″ thick.
5. 22,000 volt cable to have 9/32″ insulation around each conductor and 6/32″ over all.
6. Test tags to be attached to each cable.
7. Final test to be made with cables in place.
8. Contractor to make static tests.

IV. LEAD SHEATH:

All cables to have lead covering 1/8″ thick.

V. INSTALLATION:

1. Contractor to clean ducts before drawing in cables.
2. Cables are to be protected from injury.
3. Lacing device and not clamp to be used in pulling.
4. Joints are to be made only at manholes.
5. Copper sleeves are to be used at joints.
6. Insulation test to be made after joints are completed.
7. Taps of 500,000 c. m. cable at points to be designated by the Engineer.

VI. GUARANTEE:

Contractor to guarantee cables for five years.

DIGEST OF SECTION V.

SPECIFICATION FOR OVERHEAD CONSTRUCTION.

I. GENERAL:

This specification covers the labor and material for installing and testing the OVERHEAD WORK.

II. TYPE AND AMOUNT. See Diagram No. VII.

There will be overhead work for double track with cross suspension construction, and overhead work for single track with side pole bracket construction.

III. DETAILS OF CONSTRUCTION:

1. Poles are to be of iron and steel, of a neat and artistic design, set in concrete.
2. Span wires to be of three-eighths inch (3/8") double galvanized strand with insulated hangers, Brooklyn strain insulators at poles, and with approved additional insulators in span wire near hangers.
3. Trolley wire to be No. 2/0 B. & S. gauge, hard drawn copper, suspended from hangers by mechanical clips.
4. Pole brackets to be of flexible suspension type.
5. At end of each curve and as often as 2,000 feet in the tangents, the trolley wire is to be anchored, as specified and directed.
6. Contractor to trim all trees as directed by the Engineer, who will secure the necessary permits.
7. Feeder taps will be made at least five times in each mile.

IV. SPECIAL WORK:

The following pieces of special work will be required:

1. Double track curves at intersections of Western Avenue with Harrison Street and with Twelfth Street.
2. Trolley runways under Rockwell Street viaduct and under Metropolitan Elevated structure and upon Ogden Avenue bridge.
3. Double track crossings at Robey Street, Taylor Street, Twelfth Street, Western Avenue and Twenty-second Street.
4. Single track crossing and parallel construction at Robey Street.
5. Branch at Ogden Avenue and Harrison Street.
6. Terminal anchorages.

V. ADJUSTMENT AND TEST:

After the overhead work is in place, it shall be finally adjusted to secure smooth operation, and if within a period of sixty days' operation it shall be pulled out of place on account of defective workmanship or material, the Contractor is to repair and readjust the work.

Before final acceptance, the entire installation shall stand the specified insulation test.

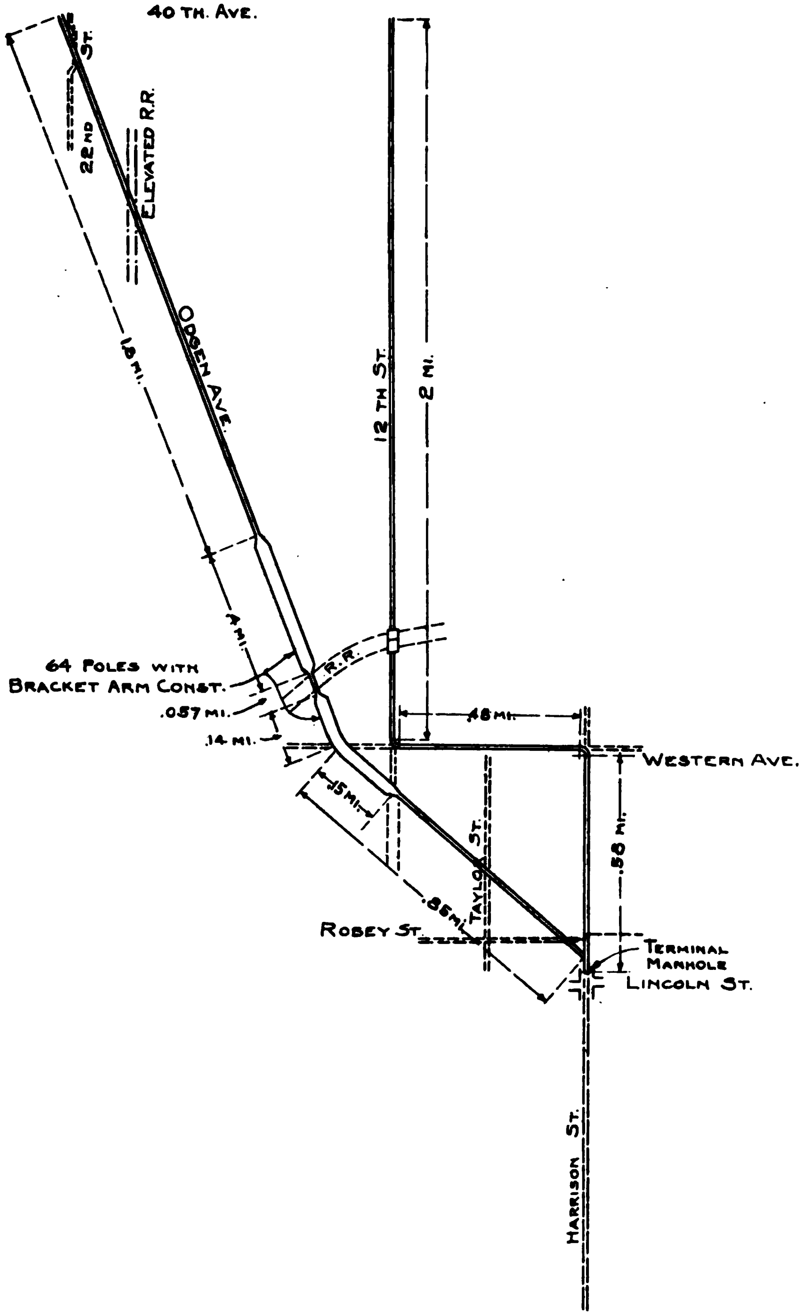


Diagram No. VIII

Overhead Construction

DIGEST OF SECTION VI.

SUB-STATION EQUIPMENT.

GENERAL SPECIFICATIONS.

The general specifications for the SUB-STATION EQUIPMENT are the same as for the power plant equipment and are covered in the detailed specifications under the following headings:

I. SCOPE OF SPECIFICATION.
II. DRAWINGS.
III. WORKMANSHIP AND MATERIAL.
IV. FINISH.
V. ERECTION.
VI. OPERATION AND TEST.
VII. GUARANTEE.

I. SCOPE OF SPECIFICATIONS:

Specifications to cover sub-station complete excepting buildings and lighting.

II. DRAWINGS:

Specify drawings to be furnished (a) by Bidder (b) by Contractor.

III. WORKMANSHIP AND MATERIALS:

General Requirements as to quality of materials and character of work.

IV. FINISH:

Finish and painting of cast iron and finish of finished iron and steel are specified.

V. ERECTION.

Competent services for supervision and erection of all equipment. Builders of various equipments to co-operate.

VI. OPERATION AND TEST:

All equipment to be operated for sixty (60) days after installation and to be tested under running conditions.

VII. GUARANTEE:

One year guarantee on all equipment.

DIGEST OF SECTION VI.—A.

SPECIFICATION FOR ROTARY CONVERTERS FOR SUB-STATIONS.

I. GENERAL:

This specification covers the ROTARY CONVERTERS FOR SUB-STATIONS.

II. TYPE AND CAPACITY:

Each converter shall be designed to receive six-phase 25 cycle alternating current at approximately 425 volts and to transform it to direct current at approximately 600 volts. Each converter shall be a self-contained unit with field frame divided in a horizontal plane.

III. PERFORMANCE:

1. Each converter to operate at full load and at load as high as two hundred per cent without heating above the temperature specified in the detailed specifications; and also to be capable of frequently standing a three hundred per cent momentary load.

2. Rotary converters are to be designed to run in parallel and to operate without sparking from no load to 150% load without adjusting the brushes.

3. Efficiencies are to be not less than specified.

IV. REQUIREMENTS:

1. Normal direct current voltage to be 600 volts.

2. Armature insulation to be subjected to a puncture test of 3,500 volts, and field insulation to a puncture test of 5,000 volts.

3. Shunt field windings to have sufficient capacity for maintaining 625 volts at full load with a power factor of 100% at a. c. end.

4. Rotary converters are to be furnished with starting apparatus suitable for starting from both the a. c. and d. c. sides.

V. DETAILS OF CONSTRUCTION:

1. General specifications cover the requirements for collector rings, commutator, brushes, insulation, dampers, oscillators and speed limiting device.

VI. FITTINGS:

Complete set of wrenches mounted on polished oak board; all special tools, oil gauges and foundation bolts to be furnished. The wiring between rheostats and dial plates and all necessary terminals and binding posts to be furnished with the rotary.

VII. GENERAL DIMENSIONS:

Bidder to furnish with his detailed proposal general dimensions of rotary converters he proposes to furnish, giving weight of each part of field and of the armature and of the complete machine.

DIGEST OF SECTION VI.—B.

SPECIFICATION FOR AIR BLAST TRANSFORMERS FOR SUB-STATIONS.

I. GENERAL:

This specification covers the AIR BLAST TRANSFORMERS FOR SUB-STATIONS.

II. TYPE AND CAPACITY:

The transformers are of the air blast type 22,000 volt primary and 425 volt secondary designed to operate on 25-cycle circuits. Capacities to be 375 or 200 K. W. each.

III. PERFORMANCE:

1. The transformers are to carry continuous loads of 125% of full load capacity, and 3-hour loads of 150% and 30-minute loads of 200% without serious heating. Furthermore they shall

stand a one-minute load of 300% and a two-second load of 1,000%.

2. The quantity of air and power required for cooling transformers shall be specified by bidder.

3. The efficiencies of transformers at loads ranging from 25% to 150% shall be specified by bidder.

IV. REQUIREMENTS:

1. Transformers are to be supplied with 3-phase current at 22,000 volts and are to furnish 6-phase current to rotary converters.

2. Transformers shall be designed to operate either each as a single unit or in groups of three as 3-phase to 6-phase transformers.

3. Suitable inductance shall be provided with transformers to suit the type of rotary used.

4. Insulation shall not be injured by occasional temperature of 95° C. nor by a continuous temperature of 80° C. Coils may be tested in water at 22,000 volts. Primary insulation of completed transformer will be subjected to 45,000 volts, and secondary to 7,500 volt test.

5. The steel used for cores shall be of high magnetic quality.

V. DETAILS OF CONSTRUCTION:

1. Housing of iron or steel for receiving air shall be constructed to allow easy access to interior of transformers.

2. Air supplied for cooling shall be controlled by dampers.

3. Ample ventilating ducts shall be provided.

4. Extra heavy insulation shall be provided on ends of windings.

5. Terminals shall be located in base of transformers and provided with suitable connectors.

VI. GENERAL DIMENSIONS:

Contractor shall submit general dimensions of transformers.

DIGEST OF SECTION VI.—C.

SPECIFICATION FOR BLOWER SETS FOR SUB-STATIONS.

I. GENERAL:

This specification covers induction motor driven BLOWER SETS FOR SUB-STATION ready for operation.

II. TYPE AND CAPACITY:

1. The blower sets shall consist of a volume blower direct connected to a 3-phase, 25 cycle, 425 volt, "Squirrel cage" type, induction motor.

2. The blower shall be capable of delivering 10,000 cubic feet of air per minute at ¾ ounce pressure.

3. The motor shall have an output of 5 K. W.

III. PERFORMANCE:

1. The motor shall be capable of delivering 125% load for 24 hours, without undue heating, and shall be capable of delivering 150% load for 3 hours without undue heating.

2. The Contractor shall specify the efficiencies of motor at various loads ranging from 25% to 150% normal load.

IV. REQUIREMENTS:

1. The blower set is to furnish air to air cooled transformers installed in sub-station. The air is to be discharged from bottom of blower into air chamber in basement.

V. DETAILS OF CONSTRUCTION:

1. Blower set shall be furnished with cast-iron sub-base on which are installed blower and motor. Motor to be connected with fan axle by flexible coupling.

2. The fan housing shall be of steel and of substantial and rigid construction. The bearings shall be self-aligning and self-oiling.

VI. FITTINGS:

1. Suitable compensator shall be furnished for starting motor.

2. The Contractor shall furnish with each blower set all necessary tools required in the care or adjusting of the apparatus.

VII. DIMENSIONS:

The Contractor shall furnish all dimensions and weight of the blower set.

DIGEST OF SECTION VI.—D.

SPECIFICATION FOR MOTOR GENERATOR SET FOR SUB-STATIONS.

I. GENERAL:

This specification covers the MOTOR GENERATOR SET FOR SUB-STATIONS.

II. TYPE AND CAPACITY:

1. The motor generator set is to consist of a 600 volt, direct current motor, direct connected to a 125 volt, direct current generator.

2. The normal output of the generator is to be 15 K. W.

III. PERFORMANCE:

1. The motor generator set is to carry 125% normal generator load for 24 hours without undue heating, and is to carry 150% normal generator load for 3 hours without undue heating.

2. The bidder will specify the combined efficiency of motor generator set at various loads ranging from 25% to 150% of normal generator load.

IV. REQUIREMENTS:

1. The motor generator set is designed to receive d. c. current at about 600 volts, and to furnish d. c. current at about 125 volts, for operating remote control apparatus, a small number of lights, and charging storage battery in sub-station.

2. Motor shall be tested at 2,500 volts a. c. and generator at 1,500 volts a. c. for a period of one (1) minute.

3. The generator shall be compound wound and so designed that the variation of voltage from no load to full load shall not exceed 3%.

V. DETAILS OF CONSTRUCTION:

1. Motor generator set shall be provided with cast iron base.

2. Commutators shall be made of hard drawn copper insulated with mica; current density not to exceed 30 amperes per square inch.

VI. FITTINGS:

1. Rheostat shall be furnished with the generator, of such capacity as to change generator voltage from 85 to 130 volts. Rheostat shall be furnished for starting motor.

2. All necessary tools and implements required for the care and adjustment of motor generator set shall be provided.

VII. DIMENSIONS:

1. Contractor shall furnish dimensions and weight of motor generator set.

2. Contractor shall furnish dimension prints of starting boxes and rheostats.

DIGEST OF SECTION VI.—E.

SPECIFICATION FOR STORAGE BATTERY FOR SUB-STATION.

I. GENERAL:

This specification covers STORAGE BATTERY to be located in sub-station.

II. TYPE AND CAPACITY:

The battery is to consist of 60 cells of 150 ampere-hour capacity, capable of discharging at the rate of 15 amperes for a period of 10 hours.

III. PERFORMANCE:

1. When discharging at specified rate and for specified time, the electro-motive force of any cell shall not drop below 1.6 volts, assuming battery to be fully charged before beginning run.

2. Battery shall be capable of standing momentary discharges of three times its normal ten-hour discharge rate.

IV. REQUIREMENTS:

1. The battery is to be used in furnishing current for the control apparatus in sub-station and for lights.

2. Electrolyte shall be made from acid free from iron, chlorine and heavy metals and of a density and purity recommended by the Contractor. Sufficient electrolyte shall be furnished for the proper operation of battery.

3. Each cell shall be provided with suitable insulators.

4. Battery shall be provided with suitable stand or rack for assembling cells in compact manner. Contractor shall submit designs of proposed arrangement.

5. Plates shall be installed in suitable tanks of treated wood lined with lead. Tanks will be of such depth as to provide sufficient space in tank below bottom of plates to take care of sediment and shall be large enough to allow the capacity of the battery to be doubled.

V. DETAILS OF CONSTRUCTION:

1. The plates in each cell and connections between cells shall be burned to lead bus bar.

2. Plates shall be separated from each other by standard form of separator, and shall be supported by lugs cast on plates near top.

VI. DIMENSIONS:

Contractor shall furnish dimensions and weights of cells he proposes to furnish.

DIGEST OF SECTION VI.—F.

SPECIFICATION FOR SWITCHBOARDS, SWITCHING EQUIPMENT AND WIRING FOR SUB-STATIONS.

I. GENERAL:

This specification covers the furnishing, installing and testing of all SWTICHBOARDS, SWITCHING EQUIPMENT AND WIRING for sub-stations.

II. REQUIREMENTS:

1. The switchboards, switching equipment and wiring are to be installed in sub-stations and used for operating and controlling the rotary converters furnishing power to a street railway. High tension bus will be supplied with 3 phase, 25 cycle current at 22,000 volts. Direct current will be supplied at about 600 volts. One group of feeders will supply current to section of road provided with trolley. Another group of feeders will supply current to section of road fed by two conductors installed in conduit. Latter group of feeders shall be so connected that either conductor in conduit may be made positive or negative.

2. All connections between switchboards and rotaries shall be furnished and installed.

3. All connections between the power transformers and the rotaries shall be furnished and installed.

4. All connections for furnishing current to motor-driven blower shall be provided.

III. HIGH TENSION BUSES AND APPURTENANCES:

1. All high tension bus bars shall be of copper of high conductivity and of ample current-carrying capacity.

2. Insulators supporting the bus bars shall be of three part porcelain and shall be mounted upon rigid pins.

3. Disconnecting switches shall be furnished and installed with each oil switch.

4. Fuses for all potential transformers. Sectionalizing switches in high tension bus between rotary converter taps.

5. All high tension wiring, after installation, shall be subjected to 44,000 volt test.

IV. OIL SWITCHES:

1. Contractor shall furnish and install oil switches as follows:
One for each high tension line.
One for each rotary converter.

Oil switches are to be of the electrically operated remote control type and furnished with necessary oil for operating.

2. Brick cells for mounting oil switches.
3. Fireproof doors for oil cells and disconnecting switches.
4. Carrying capacity, 300 amperes per phase.

V. HIGH TENSION LINE EQUIPMENT:

1. Each feeder line shall be provided with static arresters and disconnecting switches.

2. Each conductor of feeder line shall be furnished with potential indicators.

VI. INSTRUMENT TRANSFORMERS:

1. The necessary instrument transformers and supports.
2. The number of transformers shall be as follows:
   a. One potential transformer, 13,000—110 volts on each bus section.
      Two 425—110 volt transformers for each rotary.
   b. Current transformers:
      Three 22,000 volt transformers on each feeder.
      Three 22,000 volt current transformers on each rotary.

3. All instrument transformers shall be adjusted and calibrated.

4. Transformers shall be capable of carrying full load continuously without rise of temperature exceeding 40° C.

5. Transformers shall be tested by applying 44,000 volts between primaries and secondaries and primary and frames for one minute, and by applying 1,000 volts between secondaries and frame for one minute.

VII. DIRECT CURRENT BUS BARS:

1. All bus bars and supports for all positive, negative and equalizer buses shall be of sufficient section to carry continuously 50% overload without undue heating.

2. After installation they shall be tested at 3,000 volts.

3. There will be a main and auxiliary positive and a main negative bus for rotary and trolley feeder panels. There will be main and auxiliary buses for both positive and negative of

conduit feeder panels. Trolley feeder buses will be direct connected to rotary buses. Conduit feeder buses will be connected to rotary buses through reversing switch.

VIII. ROTARY CONVERTER A. C. STARTING PANEL:

Each rotary converter will be provided with panel for starting.

IX. DIRECT CURRENT MAIN SWITCHBOARD:

1. Contractor shall furnish and install a d. c. switchboard.

2. The apparatus to be installed on various panels is listed in detailed specifications under:

A. Rotary converter starting panel.
B. Rotary converter running panel.
C. Bus reverse panel.
D. Conduit feeder panels.
E. Trolley feeder panels.
F. Motor panel for motor generator set.
G. Generator panel for motor generator set.
H. Battery panel.
I. D. c. and a. c. power and light panel.

X. INSTRUMENTS:

All indicating and recording instruments shall be furnished under this contract. They shall be of high degree of accuracy, dead beat and carefully calibrated.

XI. CONTROL BOARD:

Contractor shall furnish and install control board and all appurtenances for controlling the high tension switches. The apparatus to be installed is listed in detailed specification under:

A. High tension feeder panels.
B. Rotary converter panels.
C. Station panel.

XII. POWER CIRCUITS:

1. Another specification will cover all high tension and feeder cables. This Contractor shall make connections with feeder terminals and shall furnish and install all end bells and complete all high tension wiring in sub-station, and shall furnish and install all necessary insulators, pins, bushings and other accessories necessary to support side wiring. All conductors shall be of high conductivity. Joints shall be avoided wherever possible.

2. High tension connections to transformer deltas, and all high tension connections between bus bars and disconnecting switches, and between disconnecting switches and oil switches shall be of copper tube of ample capacity. Other high tension connections shall be of stranded cable, highly insulated.

3. All low tension a. c. wiring shall be of stranded cables, insulated with paper or cambric and fireproof braid.

4. Direct current conductors shall be installed from rotaries to direct current bus bars.

XIII. LIGHTING TRANSFORMERS:

The Contractor shall furnish and install two single phase, 25 cycle, 5 K. W. oil cooled lighting transformers with a ratio of 425 to 125 volts and make all connections from transformers to a. c. lighting panel and to a. c. supply.

XIV. CONDUIT AND JUNCTION BOXES:

Contractor shall furnish and install all conduit and junction boxes required for control and instrument wiring.

XV. CONTROL AND INSTRUMENT WIRING:

1. Contractor shall furnish and install all control and instrument wiring. Control and instrument wiring shall be installed in separate conduits.

2. Terminal boards shall be provided at ends of each cable for separate wires of cable.

DIGEST OF SECTION VII.

SPECIFICATION FOR ROLLING STOCK.

I. SCOPE OF SPECIFICATION:

This specification covers the following equipment:

A. PASSENGER CARS.

B. STREET SWEEPER, SNOW PLOW, SPRINKLER AND REPAIR WAGON.

C. CONTACT PLOW.

II. DRAWINGS:

1. *Drawings to be furnished by Bidder.*—Bidder will submit with proposal drawings showing the general design and dimensions of each part of the equipment he proposes to furnish. The drawings accompanying this specification are intended as suggestions only,—it being the intention to allow latitude to manufacturers in submitting their own designs.

2. *Drawings to be furnished by Contractor.*—The successful bidder shall submit for the approval of the Engineer drawings showing in detail the design of all parts.

III. WORKMANSHIP AND MATERIAL:

1. The workmanship and materials throughout to be of the highest grade.

2. All screw threads to conform to U. S. standard.

3. All painting to be done in accordance with specifications and directions to be furnished to the Contractor by the Engineer.

4. Standard specifications will also be furnished by the Engineer covering the following: Steel castings, grey iron castings, malleable iron castings, machinery steel, structural steel, plate steel and glass.

5. Drawbars and safety chains to be of uniform design.

IV. GUARANTEE:

Should any parts fail or defects develop from causes other than wear and tear or accident within one year after acceptance, same shall be replaced or repaired by the Contractor free of charge.

DIGEST OF SECTION VII.—A.

SPECIFICATION FOR PASSENGER CARS.

I. GENERAL:

This specification covers the building, delivery and testing of PASSENGER CARS.

II. TYPE AND CAPACITY:

1. The passenger cars are to contain as little combustible material as possible and at the same time are to possess every advan-

tage of lightness, strength, comfort and durability consistent with the present art of building a non-combustible car.

2. This specification is preliminary and is intended only as a suggestion to the bidder in preparing his detailed proposal.

3. Each car is to have a comfortable seating capacity of not less than 48 nor more than 52 passengers and standing room as large as consistent with the design.

III. DETAILS OF CONSTRUCTION:

The preliminary specification shows general requirements under the following heads:

Bells, brakes, bumpers, cash registers, ceiling, curtains, distributing panel, fenders, finish, flashing, floor strips, grab handles, hardware, head light, push buttons, seats, signs, steps, trolley harp and board, window guards and wiring.

IV. AIR BRAKES:

To be of the straight air type with motor-driven compressor on each car, complete with fittings, gauges, whistle, sanding attachment, piping, rods, levers, etc.

V. TRUCKS:

1. Wheel base to be not more than six feet nor less than four feet six inches. Wheels to be thirty-three (33) inches in diameter with five-eighths inch (5/8") flange and two and one-half inch (2½") tread. Car bodies and trucks to be designed to provide ample clearance on a 40 foot radius curve.

2. Wheels to be of chilled cast iron, uniform in all dimensions and in quality of metal and chill. Wheels not to vary from specified weight more than 2%. Bidder may give extra price on rolled steel or steel tired wheels.

3. Axles to be not less than 5¼" in diameter and to be of hammered steel.

VI. ELECTRICAL EQUIPMENT:

1. Each car to be provided with four motors of sufficient capacity to operate the car under extreme conditions of schedule and speed in regular city service continuously without exceeding the rise in temperature specified.

2. Cars to be complete with lights, wiring, head lights, controllers, trolley wheels and bases.

3. Contractor to furnish detailed drawings for approval and to submit a diagram showing the characteristics of the motors he proposes to furnish.

DIGEST OF SECTION VII.—B.

SPECIFICATION FOR SWEEPER, SNOW PLOW AND SPRINKLER.

I. SWEEPER. To be complete with two motors for moving car and two motors in cab for operating the two double gang rotary brooms which are to diagonally span the full width of the track. Motors to be interchangeable with passenger car equipment. Sweeper to be complete with cab and wings.

II. SNOW PLOW. To be complete with four motors mounted on double trucks. Both trucks and motors to be interchangeable with the car equipments. Plow to have air brake equipment and pneumatic device for operating the steel nose attachments. independently on either end of car. Provide wings and operating mechanism and substantial cab. Plow to be adapted for use as a repair or construction car.

III. SPRINKLER. To be complete with four moters mounted on double trucks. Both motor and trucks to be interchangeable with the car equipment. Sprinkler to have a steel tank having a capacity of not less than 5,000 gallons and is to be arranged to either flush the track by gravity or to be used for sprinkling the entire width of the street by means of compressed air or otherwise. Sprinkler to be equipped with special nozzles for cleaning head of rail. Provide sprinkler with awning, head light, air and hand brakes and all attachments.

DIGEST OF SECTION VII.—C.

SPECIFICATION FOR CONTACT PLOW FOR CAR.

I. GENERAL:

This specification covers the CONTACT PLOW.

II. SHOE:

The collector shoe will be grey iron, 8″ in length, bolted to spring brushes.

III. SPRING BRUSHES:

Laminated phosphor bronze springs, containing not less than four (4) laminations and of the required resiliency to afford a pressure of 12 pounds when compressed one inch; to have carrying capacity of 90 amperes; the ends of the springs bearing upon copper ribbons attached to the body of the plow.

IV. CONDUCTOR:

The conductors to the car terminals consist of No. 3 B. & S. 61 strand double rubber covered and braided wire, encased in the rubber bushing through the yoke and flattened to occupy the space between the protection plates of the shank. The lower part of the conductor wire is insulated with 3/64″ cambric and rubber. The conductor is split near the end and the two divided ends thoroughly insulated and connected to the terminals of the copper ribbons.

V. COPPER TUBE PROTECTION:

That portion of the conductor wire between the yoke and the maple body of the plow is encased in a seamless copper tube of No. 27 copper, and flattened so as to occupy the space between the encasing plates.

VI. YOKE.

The plow is carried by a cast iron yoke upon channels suspended from the car and cored to receive the rubber bushings of the terminal wires.

VII. STEEL SHANKS:

The plow is connected to the yoke by two steel shanks 3/16″ thick by 3½″ wide, with a 3″ space between them, in which space the conductor wires are carried. Protection plates and wearing pieces at the slot line are riveted to the shanks.

VIII. MAPLE WOOD BODY:

Two pieces of maple wood, boiled in paraffin, form the body of the plow, and are bolted to the steel shanks. One inch (1″) square fiber blocks are attached to the maple wood body and carry the brush spring, shoes, etc., as shown upon Drawing No. 20.

DIGEST OF SECTION VIII.

BUILDINGS.

GENERAL SPECIFICATIONS.

I. SCOPE OF SPECIFICATIONS:

These specifications are intended to cover all labor and materials required to complete the following:

A. CAR HOUSE and equipment.

B. REPAIR SHOPS and equipment.

C. SUB-STATION (building only), with crane.

D. POWER HOUSE AND SWITCH HOUSE (building only), with crane, chimney, breeching, coal and ash handling equipment.

II. GRADING, EXCAVATING AND FILLING:

Grading, excavating and filling to be done as directed.

III. WORKMANSHIP AND MATERIALS:

1. *General.*—All workmanship and materials to be first-class for purposes intended.

2. Specifications give the requirements for masonry, cement, sand, stone, gravel, lime, mortar, concrete, brickwork, coping, reinforced concrete, woodwork, steel structural work, roofing.

3. *Painting.*—
   - a. *Steel Structure Work.* To be given two coats of approved graphite paint.
   - b. *Wood Work.* To be given two coats of lead and oil paint.

4. *Water Supply and Drainage.*—
   - a. *Cold Water.* Connections to be made to city mains and water piped to all parts where required.
   - b. *Hot Water.* To be supplied to the lavatories at all seasons. A separate heater to be installed to supply hot water when the general heating system is not in operation.
   - c. *Drainage.* Connections to be made to city sewer, and sewers and drains of ample capacity and approved design to be constructed from all parts of the plant where required.

5. *Lavatories and Lockers.*
   - a. *Lavatory Fittings.* Wash basins, water closets and urinals to be of porcelain of good quality and approved form. Basin slabs to be of marble. Plumbing to be open, of good quality and approved design. All stalls and partitions to be of hard pine.
   - b. *Lockers.* To be of expanded metal or some other good form of ventilated metal locker.

DIGEST OF SECTION VIII.—A.

SPECIFICATION FOR CAR HOUSE.

I. GENERAL:

This specification covers the CAR HOUSE, together with offices, waiting rooms, etc.

II. CAR HOUSE:

Car house is to consist of two compartments with fire wall between. The general specifications show the requirements for foundations, pits and floors, roof, doors, windows and tracks. Building to be entirely of reinforced concrete.

III. OFFICES, ETC.:

1. Office building to be strictly independent of the car barn. Foundations, floors, frames, roof, doors and windows to be as specified.

2. Offices to be provided with suitable furnishings, including recording check system and a fireproof vault.

3. Lavatory and locker rooms to be provided with equipment for one hundred forty (140) men.

4. The store room, oil room and shops to be provided with shelves, bins, benches, cupboards, and an outfit of tools for small repair work.

IV. HEATING SYSTEM:

1. Heating and ventilating to be done by the fan system with motor-driven fans.

2. This heating system to be complete with boilers, piping, distributing ducts and registers.

V. WATER SUPPLY AND DRAINAGE SYSTEM:

An ample water supply and drainage system to be built in accordance with detailed specifications.

VI. LIGHTING SYSTEM:

To consist of incandescent lights with arc lights for general illumination.

VII. TRACK SYSTEM:

To be in accordance with general requirements for track and as shown on Diagram No. XXVI.

DIGEST OF SECTION VIII.—B.

SPECIFICATION FOR REPAIR SHOP AND EQUIPMENT.

I. GENERAL:

This specification covers the MAIN REPAIR SHOP and all lighting, heating, power, water and drainage systems.

II. MAIN CAR SHOP:

1. This building is to be built with a main center span provided

with a crane and two side spans. Specifications cover the requirements for foundations, floor, frame, walls, roof, doors and windows.

2. This building also contains the blacksmith shop, stock room, office, tool room and lavatory.

3. There are to be repair tracks provided with pits and a drop pit for wheels.

4. Machine shop, blacksmith shop, tool room and electrical department are to be provided with all necessary fittings, with a complete equipment of machine and small tools; and the office and stock room is to have the necessary furniture and systems for time recording and checking out tools and supplies.

III. PAINT SHOP:

1. This building is to be built in separate compartments, fitted with rolling doors. Construction to be entirely of concrete. Roof to be of "saw-tooth" type.

2. Detailed specifications show the requirements for roof, doors, frames, windows and floors.

3. The carpenter shop is to be equipped with all necessary tools. An extra lavatory and locker room to be furnished.

IV. STORE HOUSE FOR PAINT AND OILS:

Construction to be entirely of concrete, with window and door frames of metal.

V. HEATING AND VENTILATING SYSTEM:

1. Heating and ventilating to be by the fan system with motor-driven fans of a capacity to change the air in buildings four times per hour, and of sufficient capacity to keep the temperature at 60° Fahrenheit with the outside temperature at—10° Fahrenheit.

2. Heating system to be complete with boilers in duplicate, piping and stack.

3. Boiler house of fireproof construction; to be separate from main buildings and provided with a coal storage.

VI. WATER SUPPLY AND DRAINAGE SYSTEM:

The entire grounds and buildings to be provided with ample water supply and drainage facilities.

VII. LIGHTING SYSTEM:

Arc lamps for general illumination and incandescent lamps for local lighting.

VIII. TRACK SYSTEMS:

Complete system of tracks, together with overhead work, as indicated on Diagram No. XXV.

IX. POWER SYSTEM:

Power to be taken from the railway circuits. Individual motors to be placed upon machines requiring more than three horse power. Other machines to be operated in groups from line shafting.

DIGEST OF SECTION VIII.—C.

SPECIFICATION FOR SUB-STATION BUILDING.

I. GENERAL:

This specification covers the SUB-STATION BUILDING, crane, feeder manhole and conduits, and heating, lighting, water and drainage systems.

II. BUILDING:

1. This building to be a handsome and substantial structure of artistic design. To consist of main floor and basement.
2. To be of reinforced concrete with veneering as may be specified.
3. Window sash and frames to be of metal.
4. Doors to be of oak.
5. Main floor to be tiled. Basement floor to be of concrete.

III. FOUNDATIONS:

All foundations to be of concrete.

IV. BARRIERS:

Barriers and bus-bar compartments to be built of reinforced concrete or other approved construction.

V. MANHOLE AND CONDUITS:

Main distributing manhole to be provided; also all necessary conduits.

VI. CRANE:

A 15-ton hand power traveling crane to be installed.

VII. HEATING SYSTEM:

A direct radiation steam heating system of ample capacity to be installed.

VIII. WATER SUPPLY AND DRAINAGE:

Building to be equipped with lavatory, water closet and water supply and drainage systems.

IX. LIGHTING:

A system of arc and incandescent lamps to be installed.

X. FURNISHINGS:

Appropriate furnishings to be provided.

DIGEST OF SECTION VIII.—D.

SPECIFICATION FOR POWER PLANT BUILDINGS.

I. GENERAL:

This specification covers the POWER HOUSE, SWITCH HOUSE AND EQUIPMENT, other than steam and electric plant.

II. POWER HOUSE BUILDING:

This building to consist of boiler room, turbine room and coal dump, separated by brick walls. Basement under boiler room and coal dump. Floor in turbine room tiled; other floors of concrete.

Frame to be of steel, walls of brick and roof of tile.

Fifty (50) ton electric traveling crane and a switch-board gallery to be provided in turbine room.

III. FOUNDATIONS.

All foundations to be of concrete.

IV.. BREECHING AND STACK:

1. Breeching to be of metal with refractory lining.
2. Stack to be of brick or reinforced concrete.

V. COAL AND ASH-HANDLING EQUIPMENT.

A complete system of conveyors, tanks, hoppers, etc., for storing and handling coal and ashes to be installed.

VI. SWITCH HOUSE:

1. This building to be entirely of reinforced concrete with metal fixtures. To consist of main floor and basement.

2. Barriers to be built as required of reinforced concrete or other approved construction.

VII. HEATING SYSTEM:

A direct radiation steam heating system of ample capacity to be installed.

VIII. WATER SUPPLY AND DRAINAGE:

The building to be equipped with lavatory, closets and water supply and drainage systems.

IX. LIGHTING:

A system of arc and incandescent lighting to be installed.

DIGEST OF SECTION IX.

GENERAL SPECIFICATION FOR POWER PLANT EQUIPMENT.

I. GENERAL:

This specification includes all labor and material required to construct, install and test a complete POWER PLANT EQUIPMENT.

II. DRAWINGS:

1. *Drawings to be Furnished by Bidder.*—Bidder will submit with proposal drawings showing the general dimensions of each part of the equipment and such detailed drawings as may be required by the Engineer to show the design of all important parts.

2. *Drawings to be Furnished by Contractor.*—The successful bidder is to submit for the approval of the Engineer drawings showing detailed dimensions of all parts and is to secure the approval of the makers of equipments of the drawings showing the fits of contiguous parts.

III. WORKMANSHIP AND MATERIAL:

1. All workmanship and material shall be in full accord with the most modern mechanical and electrical engineering practice.

2. All wiring connections to conform to the requirements of the National Board of Fire Underwriters.

IV. FINISH:

1. All castings to be filled and carefully rubbed, then painted and again rubbed before shipment.

2. After erection all moving machinery to receive a finishing coat of hard drying paint and two (2) coats of hard varnish. All finish work shall be brightly polished and carefully slushed with white lead and tallow before shipment, and after erection to be cleaned and polished.

V. ERECTION:

The Contractor is to furnish the services of an experienced erecting engineer and all labor to properly erect, adjust, start, operate and test each part of the equipment.

VI. OPERATION AND TESTS:

1. *Operation.*—After each part of the power plant is erected and ready for regular service, the Contractor is to superintend the operation of the same for a period not less than sixty (60) days, or until the apparatus is accepted by the Engineer. Steam, supplies and attendants for this purpose to be furnished by the City.

2. *Test.* After each part of the power plant equipment is in good working condition and is carrying its portion of the regular daily load, an eight (8) hour continuous run test under actual work-

ing conditions shall be made. The City will furnish steam, supplies and all station attendants, and the Contractor shall supply instruments, tanks, observers and testing engineers. Tests shall be made under the joint direction of the Engineer and Contractor, and final reports and results shall be acceptable to the Engineer. The above tests shall be made within sixty (60) days after the Contractor has advised the City that the apparatus is ready for official test.

VII. GUARANTEE:

Contractor shall guarantee the entire power plant equipment for a period of one (1) year against defects in workmanship or material, provided that during this period the apparatus is not taxed beyond its guaranteed capacity, is regularly cleaned and properly maintained. Contractor will also guarantee that the efficiency and regulation of the various units shall be sustained up to the specified standard under the above conditions.

DIGEST OF SECTION NO. IX.—A.

SPECIFICATION FOR TURBO-GENERATORS.

I. GENERAL:

This specification includes the delivery, erection, operation and test of TURBO-GENERATORS.

II. TYPE AND CAPACITY:

1. Turbo-generators are to be designed to furnish 3-phase alternating current at 25 cycles per second at 22,000 volts' pressure.

2. Turbines are to be of the direct connected type, the generators and turbines mounted on cast iron bed plate.

3. Each generator will deliver 3,000 kilowatts and will be capable of standing tests at 25 per cent. and at 50 per cent. overload, within the limits of heating specified in the detailed specifications.

III. PERFORMANCE:

1. Steam pressure to be 175 lbs. per square inch, super heat 150° Fahrenheit, and vacuum 28″ at full load.

2. Turbines are to be designed for parallel operation. Turbine governor to be arranged for control from the station switchboard by an electric speed changing device. Speed variation to be not more than 2 per cent. from full load to no load and vice versa.

3. *Efficiencies.* Bidders are invited to submit their best guarantee of duty in pounds of water per electrical horse power, both with superheated steam and with saturated steam, and the efficiency of the generator at all loads.

4. Insulation and excitation to be as specified.

IV. FITTINGS:

1. Rheostat will be furnished, of ample capacity.

2. Oiling system is to be furnished with all necessary sight feed lubricators, steam pumps, tanks, gauge glasses, oil cups and grease cups.

3. There will also be furnished throttle and exhaust valves, wrenches, eye-bolts and all special tools required for the care and adjustment of the machine.

4. Approved tachometer to be connected to show the revolutions of the turbine when throwing into parallel operation.

5. A gauge board containing gauges showing high pressure, low pressure, steam and vacuum, all set in heavy polished brass cases, complete with piping, valves and fittings, all of extra heavy brass above floor.

V. GENERAL DIMENSIONS:

Bidder will submit a detailed specification showing type of turbine, all general dimensions and detailed dimensions of important parts, together with number and location of steam and exhaust openings. Specification shall also show the speed of the turbine and the total weight of turbine and generator.

DIGEST OF SECTION IX.—B.

SPECIFICATION FOR COMPOUND RECIPROCATING ENGINES.

I. SCOPE OF SPECIFICATION:

This specification includes the delivery, erection, operation and test of COMPOUND RECIPROCATING ENGINES.

II. TYPE AND CAPACITY:

Engines are to be of the cross compound Corliss heavy duty type for direct connection to alternating generators of the revolving field type, which are to be located between the cranks of the engines. Each generator will deliver three-phase twenty-five cycle alternating current and will have a rated normal capacity of three thousand (3,000) kilowatts at twenty-two thousand (22,000) volts when operated at a normal speed of seventy-five (75) revolutions per minute.

III. PERFORMANCE:

1. Steam pressure to be one hundred seventy-five (175) pounds per square inch; superheat one hundred fifty degrees (150°) Fahrenheit; vacuum twenty-seven (27) inches.

2. Variation in speed shall be less than two (2) per cent from full load to no load, and vice versa. The speed of each engine to be controlled from a station switchboard by an approved speed-changing device.

IV. DETAILS OF CONSTRUCTION:

Specifications describe in detail the cylinders, main bearings, governors, throttle valve, safety stops, receiver and re-heaters, platforms, galleries, lagging and drip and drain system.

V. FITTINGS:

1. A full set of steam valves, oilers, wrenches and eye bolts to be furnished with each engine; also a complete set of approved

metallic packing rings for all valves and piston rods; these rings adjustable for wear and designed for highly superheated steam.

2. Provide each engine with two (2) improved steam indicators complete with springs, reducing motion, and piping of polished brass.

3. Furnish each engine with a direct reading tachometer located as directed.

4. Provide each engine with a marble board on polished brass supports containing steam gauges, vacuum gauge and receiver gauges; gauges to be twelve inches (12″) in diameter with brass cases complete with all connections.

5. *Oiling System*: Each engine to be provided with an automatic pressure closed oiling system with all necessary attachments and fittings.

VI. BIDDER'S SPECIFICATIONS:

Bidder will state the best guarantees he will make under all conditions of load on the following: Indicated horse-power, cut-off in high pressure cylinder, cut-off in low pressure cylinder, revolutions per minute, economy with superheated steam, economy with saturated steam.

VII. DIMENSIONS:

Bidder will furnish with his bid detailed specifications giving the general dimensions, the weight of the fly wheel, the weight of the engine and the total weight of the heaviest parts.

DIGEST OF SECTION IX.—C.

SPECIFICATION FOR ENGINE TYPE ALTERNATORS.

I. GENERAL:

This specification includes the delivering, operation, erection and test of ENGINE TYPE ALTERNATORS.

II. TYPE AND CAPACITY:

1. Generators are to be designed to deliver three-phase alternating current at twenty-five (25) cycles per second at twenty-two thousand (22,000) volts. Generators to be of the revolving field, direct connected, fly wheel type, located between the cranks of the engines, and to run at a speed of seventy-five (75) revolutions per minute. Each generator to be so designed that it will withstand a momentary overload of one hundred per cent (100%) without injury.

2. Alternators to be designed for parallel operation.

3. Each generator to deliver its full rated current at 22,000 volts at 100% power factor for twenty-four hours and also to stand tests at 25% and 50% overload without exceeding the heating limits given in the detailed specifications.

III. PERFORMANCE:

The inherent regulation of the generators shall not exceed five per cent.

IV. RHEOSTATS:

1. Furnish the necessary field rheostats for each generator, complete with handles and suitable pointer. Rheostat to be designed for erection back of the switchboard. Generator Contractor to make all wiring connections between generators, rheostat and switchboard.

V. BIDDER'S SPECIFICATIONS:

1. Bidder to include in his detailed specifications, drawings and information showing the dimensions of the alternators, total weight of each generator and the weight of the largest shipping part.

2. Bidder will state the efficiency which he is willing to guarantee under all conditions of load with a power factor of one hundred per cent.

DIGEST OF SECTION NO. IX.—D.

SPECIFICATION FOR WATER TUBE BOILERS AND SUPERHEATERS.

I. GENERAL:

This specification includes the delivery, erection and test of:

A. BOILERS.
B. BRICK WORK.
C. SUPERHEATERS.

II. TYPE AND CAPACITY:

Boilers to be of the water tube type, with all parts supported independently of the brick work. Each boiler to have a minimum heating surface of ten square feet for each boiler horse power.

III. PERFORMANCE:

Normal steam pressure 200 lbs. gauge pressure. Maximum steam pressure 250 lbs. Superheat to be 200° Fahrenheit. Draft equivalent to 8/10 of an inch of water.

IV. WORKMANSHIP AND MATERIAL:

1. Detailed specifications cover requirements for joints, castings, plates and rivets, non-conducting covering and painting and finish.

2. *Inspection and Test.* Before leaving the shops all pressure parts of boilers are to be shown tight under a hydrostatic pressure of 400 lbs. per square inch, and after complete erection boilers are to be again tested to 400 lbs. and shown to be perfectly tight. A certificate of inspection and insurance policy from a reliable boiler inspection insurance company is to be furnished with each boiler.

V. DETAILS OF CONSTRUCTION:

Tubes are to be of charcoal iron. Detailed specifications cover other requirements for tubes, dry pipes, mud drums, steam drums, hand and manholes.

VI. FITTINGS AND TOOLS:

Boilers are to be completely equipped with all the necessary fittings, including water columns, gauge cocks with drips, water gauges, safety alarm, steam gauges, safety valves, feed valves, check valves, hose connections, blow-off cocks, steam hose, firing tools, wrenches and tube scrapers.

VII. BRICK AND BOILER SETTINGS:

1. *Brick Work*: Exposed brick work in front of boilers to be white enameled brick. Side walls to be of well burned and sound red brick. Furnace walls to be lined with first quality fire brick; other parts exposed to fire to be of second quality fire brick. All brick to be equal to approved sample.

2. *Boiler Fronts and Wall Fixtures.* Fronts to consist of wrought iron frames fitted with doors of cast iron or of corrugated sheet iron. Settings to be complete with all necessary dampers, cleaning doors, tie rods, anchor rods, bolts, plates, nuts, washers. buck-stays, lintels, etc., all of heavy and substantial design.

VIII. SUPERHEATER:

1 Each boiler to be equipped with a superheater of flue-fired type, of sufficient capacity to add 200° Fahrenheit to the temperature of the steam. Superheaters to be subject to the same pressure test as specified for the boilers. Steam passages to be designed for the complete filling of all tubes with steam, the velocity of steam to be not less than 4,000 ft. per minute with full load.

2. Superheaters to be complete with all necessary control valves and all pipe and fittings to be extra heavy. All connections between boilers and superheaters for steam shall be above the water line of the boilers. Thermometer cups and brass cased thermometers to be furnished.

IX. BIDDER'S SPECIFICATIONS:

1. Bidder will submit detailed specifications showing the general dimensions of the boiler, total grate surface required, the number of sections and length of tubes, of steam drums, mud drums, the size and location of all steam openings.

2. The superheater specifications submitted by the bidder will show the square feet of heating surface in the tubes; the number, length and diameter, shape and arrangement of the tubes; the location and size of all steam connections:

3. *Economy Guarantee*: Bidder will submit the best guarantee of evaporation which he is willing to make, in accordance with the conditions set forth in detailed specifications.

DIGEST OF SECTION IX.—E.

SPECIFICATION FOR MECHANICAL STOKERS OR FURNACES.

I. GENERAL:

This specification covers the delivering, erection, operation and test of MECHANICAL STOKERS OR FURNACES.

II. TYPE AND CAPACITY:

Stokers to be of the automatic type with adjustable automatic feed device, designed to receive coal from overhead bins.

III. PERFORMANCE:

1. Steam pressure at throttle valve of stoker engine (if used) to be one hundred seventy-five pounds per square inch.

2. Stokers to be capable of burning sufficient semi-bituminous, run-of-mine coal to develop from the boilers a capacity of fifty per cent above rating for a period of two hours. And also be capable of developing sixty-five per cent above rating. Each stoker shall burn coal with such efficiency that the combination of boilers, superheaters and stokers will evaporate not less than ten and one-half pounds of water from and at 212° Fahrenheit per hour per pound of dry coal with a superheat of two hundred degrees Fahrenheit, with no apparent smoke at top of chimney.

IV. FITTINGS:

Contractor to furnish with each stoker complete fittings, including wrenches, firing tools, shakers, dumping bars, lubricating devices, steam and exhaust valves for engine, extra set of packing for each engine and steam gauge.

DIGEST OF SECTION IX.—F.

SPECIFICATION FOR BAROMETRIC JET CONDENSERS.

I. GENERAL:

This specification includes the delivering, erection, operation and test of BAROMETRIC JET CONDENSERS.

II. TYPE AND CAPACITY:

1. Separate condenser to be furnished for each generating unit; to be of the barometric jet type with condenser cone constructed for close connection with exhaust from its respective unit.

III. PERFORMANCE:

Steam pressure, one hundred seventy-five (175) pounds per square inch; superheat, one hundred fifty (150) degrees; vacuum measured in exhaust chamber on inside of exhaust flange, twenty-eight (28) inches.

IV. FITTINGS:

1. Furnish all cast iron thimbles for valve stems, all pipe supports, expansion hangers, roller bearings and brackets.

2. Furnish for each pump all necessary throttle valves, force feed lubricators; all cups, wrenches, bolts, drips and connections for gauges and indicators. All piping above the floor to be polished brass.

3. Furnish complete set of metallic packing rings designed for all rods.

4. Furnish gauges for steam and vacuum erected on gauge board.

5. Attach horizontal automatic relief valve to free exhaust pipe, and one full size exhaust gate valve to exhaust pipe from each engine.

V. CIRCULATING PUMPS AND ENGINES:

1. *Circulating Pumps.* To be of the centrifugal type individually driven by engine on same cast iron base.

2. *Dry Vacuum Pump.* To be of the double acting steam cylinder and double-acting air cylinder, rotative type.

VI. AUXILIARY APPARATUS AND PIPING:

1. *Air Cooler.* To be provided for cooling the vapors between the condenser cone and the dry vacuum pump.

2. *Exhaust Connections.* Exhaust connections between each engine and condenser cone, together with all necessary gaskets, bolts, etc., to be furnished by the condenser Contractor.

3. *Injection Water Piping.* To start at foot valve in intake tunnel and terminate at condenser cone; to be of cast iron, flange connected. Foot valves to be brass fitted. Furnish all priming and starting pipes and valves.

4. *Air Discharge Piping.* Furnish all air piping between condensers and dry vacuum pump, making connection to air cooler.

VII. GUARANTEE:

Contractor to guarantee each condenser unit to operate successfully with superheated steam, and that all joints in condensers and piping shall be tight during the first year of operation. Condensers are to be capable of operating at 50% above normal rated capacity in all parts, and arrangement of piping is to be such that under no possible condition can the main engine cylinders become flooded.

VIII. DIMENSIONS:

Contractor to furnish detailed drawings and specifications showing all principal dimensions.

DIGEST OF SECTION IX.—G.

SPECIFICATION FOR SURFACE CONDENSERS.

I. GENERAL:

This specification includes the delivery, erection, operation and test of SURFACE CONDENSERS.

II. TYPE AND CAPACITY:

1. Condensers shall be of the surface type, with one condenser designed for each of the main generating units.

2. Circulating water to be taken from an intake tunnel by gravity and have a temperature of seventy (70) degrees. Condenser room floor level to be taken at fifteen (15) feet above the extreme low water level.

III. PERFORMANCE:

1. Steam pressure one hundred seventy-five (175) pounds per square inch; superheat, one hundred fifty (150) degrees; inches of vacuum measured in the exhaust chamber on the inside of the turbine flange to be twenty-eight (28) inches at full load with barometer at twenty-nine (29) inches.

2. Condensers to be as direct connected as possible to the turbines.

3. *Vacuum.* Contractor shall guarantee the vacuum will in no case fall below twenty-seven (27) inches. Vacuum shall be twenty-eight (28) inches at full load either with or without the use of saturated steam.

IV. DETAILS OF CONSTRUCTION.

1. Bidder will include in his proposal detailed specifications for shells, tubes, air coolers, exhaust connections, circulating water piping and air discharge piping.

V. PUMPS AND ENGINES:

1. Circulating pump to be of the centrifugal type. Pumps to be driven by engines of ample capacity, mounted on same continuous cast iron base.

2. Dry vacuum pumps to be of the double acting steam cylinder, double acting air cylinder, rotative type with pistons mounted on the same rod. Steam cylinders to have adjustable valve gears equipped with throttle valve and speed governor. Vacuum cylinders to be water jacketed.

3. *Hot Well Pumps.* Engine driven, centrifugal wet vacuum pump shall be furnished to operate automatically, to relieve the condenser of all condensed steam as soon as formed. Condensed water to be delivered into hot wells. Pump and engine to be mounted upon one continuous heavy cast iron base.

VI. FITTINGS:

1. Furnish with each condenser a full set of steam and exhaust valves, forced feed lubricators, all necessary brass piping.

2. Furnish complete set of case-hardened wrenches and bolts and all necessary drip valves, pipes and fittings. All small piping above the floor to be of polished brass.

3. Also furnish complete set of metallic packing rings adjustable for wear and suitable for highly superheated steam.

4. Furnish pipe connections of polished brass upon each cylinder for indicators.

5. Furnish upon suitable board and completely connected steam and vacuum gauges. Also furnish necessary thermometers and automatic relief valve.

DIGEST OF SECTION IX.—H.

SPECIFICATION FOR TURBO-EXCITER.

I. GENERAL:

This specification covers the delivering, erection, operation and test of TURBO-EXCITER.

II. TYPE AND CAPACITY:

1. Turbo-exciter to be of the horizontal type, non-condensing, with automatic regulation.

2. Exciter to be capable of delivering its full load for four hours at 125 volts, with a rise in temperature in no part to exceed 45 degrees Centigrade, and to carry continuously for two hours an overload of 25% with a rise of temperature in no part to exceed 50 degrees Centigrade. Exciter to be capable of delivering fifty per cent overload momentarily without injurious heating or sparking.

III. PERFORMANCE:

1. Turbo-exciters to be designed to operate under a normal steam pressure of one hundred seventy-five pounds; superheat, one hundred fifty degrees Fahrenheit; back pressure not over two (2) pounds.

2. Speed regulation from twenty-five per cent overload to no load, and vice versa, not to exceed four (4) per cent.

IV. FITTINGS:

1. *Rheostat.* Rheostat is to be provided for shunt field suitable for mounting on back of exciter board, with extension handle and pointer.

2. With each turbo-exciter will be furnished all the necessary steam and exhaust valves, oilers, wrenches, eye-bolts and all special tools required for the care and adjustment of the machine. Furnish also suitable steam strainer to prevent wire drawing.

3. *Gauges.* Provide one high pressure and three low pressure gauges for each turbo-exciter 8½ inches in diameter mounted upon grey marble board, complete with all connections.

4. *Oiling System.* Furnish a complete automatic oiling system, sight feed lubricators, grease cups, pumps, tanks and oil fittings. All tubes above floor line to be of polished brass.

V. BIDDER'S SPECIFICATIONS:

1. Contractor is to make satisfactory guarantees of the steam consumption of each unit in terms of pounds of water per electrical horse-power when operating under all conditions of load and using either superheated steam or saturated steam.

2. Contractor is also to make satisfactory guarantees of efficiencies at all loads.

VI. GENERAL DIMENSIONS:

Bidder will include in his detailed specifications complete information in regard to the turbo-exciters; also drawings showing all dimensions. Furnish also the approximate weight of each unit.

DIGEST OF SECTION IX.—I.

SPECIFICATION FOR INDUCTON MOTOR EXCITER.

I. GENERAL:

This specification covers the delivering, erection, operation and test of INDUCTION MOTOR EXCITER.

II. TYPE AND CAPACITY:

Induction motor exciter to consist of an induction motor of the "Squirrel Cage" armature type wound for three-phase current at twenty-five (25) cycles, pressure two hundred twenty (220) volts, to be direct connected to direct current generator, and capable of delivering its full load continuously for twenty-four (24) hours at one hundred twenty-five (125) volts, with a rise of temperature in no part exceeding twenty-five (25) degrees Centigrade. Generator to be capable of withstanding an overload of fifty (50) per cent for three (3) hours with a rise in temperature in no part exceeding sixty (60) degrees Centigrade.

III. FITTINGS:

1. Provide each motor with a suitable compensator with oil break switch with all wiring between compensator and motor. Furnish also all necessary tools or implements required for the care and adjustment of the machines.

2. Furnish each exciter with a suitable rheostat for shunt field with extended hand-wheel and pointer.

IV. BIDDER'S SPECIFICATIONS:

Bidder to furnish detailed specifications showing the construction and general dimensions of the machines and the best guarantee of efficiency, power factor and slip under all conditions of load, as well as the general dimensions, weight and speed of the exciter set.

DIGEST OF SECTION IX.—J.

SPECIFICATION FOR COMPOUND NONCONDENSING EXCITER ENGINE.

I. GENERAL:

This specification covers the delivering, erection, operation and test of COMPOUND EXCITER ENGINE.

II. TYPE AND CAPACITY:

Engine to be of the horizontal or vertical compound non-condensing type for direct connection to exciter generator. Speed, two hundred fifty (250) revolutions per minute.

III. PERFORMANCE:

1. Steam pressure to be one hundred seventy-five (175) pounds; superheat, one hundred fifty (150) degrees; back pressure not to exceed two (2) pounds.

2. Engine's speed regulation from full load to no load, and vice versa, not to exceed two and one-half per cent (2½%).

IV. DETAILS OF CONSTRUCTION:

Detailed specifications to cover design of the following parts of the engine; base; bearings; crank-shaft; governor; cylinders; cylinder valves; non-conducting covering and lagging.

V. FITTINGS:

1. *Oiling System.* Furnish with each engine a complete automatic closed oiling system, including all lubricators, pumps and fittings.

2. Furnish also with each engine a complete set of wrenches, steam exhaust valves, eye-bolts, metallic packing rings, indicator reducing motion, gauge-board and all necessary fittings and pipe for drip and relief valves.

VI. BIDDER'S SPECIFICATIONS:

With the bidder's detailed specifications will be furnished information in regard to the type of the engine and the design and domensions of its parts, together with its weight.

DIGEST OF SECTION IX.—K.

SPECIFICATION FOR ENGINE TYPE EXCITER.

I. GENERAL:

This specification includes the delivery, erection, operation and test of ENGINE-TYPE EXCITER.

II. TYPE AND CAPACITY:

1. Exciter to be for direct current at a pressure of one hundred twenty-five (125) volts, designed for direct connection to steam engine.

2. Exciter to be capable of delivering continuously for twenty-four hours its full rated capacity at 125 volts with a rise of temperature in no part exceeding 35 degrees Centigrade; also to be capable of withstanding a fifty per cent overload with a rise of temperature in no part exceeding sixty degrees following full load test.

III. PERFORMANCE:

Exciter to be compound wound and the regulation to be such that with the same adjustment of field rheostats and brushes, the voltage will not vary more than one and one-half per cent above or below the rated voltage with a change in load from zero to twenty-five per cent (25%) overload, provided the speed regulation of the engine is not over two and one-half per cent. There shall be an adjustable shunt provided for varying the regulation five per cent above or below that specified above.

IV. FITTINGS:

1. Engine Contractor to furnish exciter shaft, extended base, and all foundation bolts, nuts, plates, washers, etc.

2. Exciter to be complete with rheostat of ample capacity suitable for mounting on back of board with extension handle and pointer.

DIGEST OF SECTION IX.—L.

SPECIFICATION FOR BOILER FEED PUMPS.

I. GENERAL:

This specification covers the delivering, erection, operation and test of BOILER FEED PUMPS.

II. TYPE AND CAPACITY:

1. Pumps to be outside packed plunger type, capable of handling water at a temperature of 100° Fahrenheit against a total pressure of 300 pounds per square inch at a piston speed not exceeding 40 feet per minute, with a suction lift equal to two feet. Steam pressure 185 pounds; superheat 200° Fahrenheit.
2. Pumps to be mounted on heavy cast iron bed plate.

III. DETAILS OF CONSTRUCTION:

Detailed specifications shall cover steam valves, pistons, piston rods, plungers, plunger rods, water valves and lagging.

IV. FITTINGS:

Contractor shall furnish with each pump a complete set of wrenches, relief valves, one check valve, force feed lubricator, extra set of gaskets and complete set of lubricating devices.

V. DIMENSIONS:

Bidder is to furnish detailed specifications showing detailed information in regard to all principal dimensions.

DIGEST OF SECTION IX.—M.

SPECIFICATION FOR FEED WATER HEATER.

I. GENERAL:

This specification covers the delivering, erection, operation and test of FEED WATER HEATER.

II. TYPE AND CAPACITY:

1. Heaters to be of the closed type with tubes of seamless drawn copper; shells of cast iron, with two exhaust openings.
2. Heater at full capacity to raise the temperature of the water from ninety degrees Fahrenheit to one hundred eighty degrees Fahrenheit.
3. Water compartment to handle feed water under a normal pressure of three hundred pounds per square inch and at a temperature of 200° Fahrenheit.

III. DETAILS OF CONSTRUCTION:

Detailed specifications describe the construction of bonnets, tube plates, attachments, supports and finish.

IV. TEST:

Shells to be tested in shop and after erection to a hydraulic pressure of one hundred (100) pounds per square inch; and bonnets, caps, tubes and tube plates shall be tested in shop and after erection to four hundred pounds per square inch.

V. GENERAL DIMENSIONS:

Bidder will furnish detailed drawings showing all principal dimensions.

DIGEST OF SECTION IX.—O.

SPECIFICATION FOR SWITCHBOARDS AND APPURTENANCES FOR THE POWER PLANT.

I. GENERAL:

This specification covers SWITCHBOARDS and APPURTENANCES for the power plant.

II. REQUIREMENTS:

1. Switchboards and appurtenances are to be installed in the power house and switch house for controlling three-phase turbo-generator, exciter and feeder circuits. The generators and feeder circuits will constitute a 3-phase, 25-cycle 22,000 volt system. The exciters will supply d. c. current at 125 volts. The electrical equipment will be controlled from the turbine room in the power house or from the switch house.

2. All like parts of apparatus shall be interchangeable so far as practicable.

3. Copper connections shall be of high conductivity; current density not to exceed 1,000 amperes per square inch. Joints to be eliminated as far as possible. Current density at contact surfaces to be not over 150 amperes per square inch. Copper and brass castings to be eliminated as far as practicable.

Small wiring will be not less than No. 14 B. & S. gauge and will be neatly run with least possible crossings, and the ends of conductors provided with terminals, and plainly marked.

Remote control wiring to be kept separate from instrument wiring.

4. Insulation to be fire proof.

5. Panels to be of polished black slate two inches thick.

6. Alternating current instruments to be of horizontal edgewise pattern; the ammeters to operate at about 5 amperes and the volt meters at 110 volts.

Direct current instruments to be Weston pattern or equal.

All instruments to be carefully calibrated.

Knife switches to be of copper of high conductivity, designed for 800 amperes per square inch cross-section, and 75 amperes per square inch contact area. All to be protected by fuses.

Operating boards to have pilot buses.

7. Switchboards to be supported on angle or tee iron frames.

8. Name plates to be furnished with switches for each circuit.

9. All copper parts of switches to be highly polished. Metal parts of instruments and apparatus on boards to be of a dull black finish. Control switches to be of polished brass and have red handles.

III. MAIN OPERATING SWITCHBOARD:

1. The main operating switchboard to be of the bench board type and built for two generators and eight feeder circuits. The instruments to be installed for the numbers of generators and feeders elsewhere specified, but slate shall be provided for complete board.

2. Apparatus for this switchboard is specified in detailed specification for:—

(a) Each generator panel.
(b) Each feeder panel.
(c) Common apparatus.

IV. EXCITER SWITCHBOARD:

1. Exciter switchboard shall be provided for two 100 K. W. exciters.

2. Apparatus to be installed on these panels is listed in general specifications as (a) for each steam driven exciter panel, and (b) for each motor exciter panel.

V. FIELD SWITCHBOARDS:

1. Field switchboard shall be provided for each generator.

2. The apparatus to be installed on each board is listed in detailed specifications.

VI. LIGHT AND POWER SERVICE SWITCHBOARDS:

1. Both d. c. and a. c. light and power switchboards will be installed.

2. The apparatus for these boards is listed in detailed specifications as (a) for d. c. service board for light and power; (b) for a. c. service board for light and power.

VII. INSTRUMENT BOARD:

1. The instrument board will be installed in switch house and shall provide for two generator and eight feed circuits.

Instruments and apparatus shall be provided for the number of generators and feeders specified elsewhere. The total number of slate slabs shall be furnished, but not drilled.

2. The apparatus required is listed in detailed specifications under:—

(a) For each generator panel.
(b) For each feeder panel.
(c) Common apparatus for switch house.

VIII. AUXILIARY OPERATING BOARD:

1. Auxiliary operating board is to be located in switch house, and shall have capacity for controlling two generator and eight feeder circuits.

Instruments and apparatus shall be installed for specified number of generator and feeder circuits, but slate shall be furnished for complete board.

2. The apparatus mounted on the auxiliary board is listed in

detailed specifications under:—

(a) For each generator panel.
(b) For each feeder panel.
(c) Common apparatus.

IX. SYNCHRONIZERS:

Four synchronizers and connections shall be installed; two in power house and two in switch house.

X. SIGNAL EQUIPMENT:

1. A signal board and one indicating wattmeter together with signal lamp and bell and all necessary wiring shall be installed near each turbine.

Signal boxes are to be used in connection with similar signal boxes on generator panels of operating boards.

2. Two indicating boxes shall be furnished and installed; one in the turbine room and one in the boiler room, to indicate the number of generators in operation.

XI. COPPER AND CONDUIT WORK FOR SWITCHBOARD CONNECTIONS:

Three exciter buses are to be provided. All connections between exciter switchboards and field switchboards and service switchboards shall be made.

XII. NEUTRAL GROUND CONNECTIONS:

1. All apparatus and connections for grounding the neutrals of the generators shall be furnished.

2. The apparatus to be installed in this connection is listed in detailed specifications under

(a) For each generator unit.
(b) For neutral bus.
(c) For power house.

XIII. GROUND CONNECTIONS FOR EXCITER SYSTEM:

Two ground plates, one ground bus and necessary ground connections shall be provided for the negative exciter bus.

DIGEST OF SECTION IX.—P.

SPECIFICATION FOR CABLE WORK FOR POWER PLANT. AND SWITCH HOUSE.

I. GENERAL:

This specification covers CABLE WORK in connection with the POWER PLANT.

II. REQUIREMENTS:

1. The cables are to be installed to connect the electrical equipment in the power house with the electrical equipment in the switch house, and will be used in connection with the operation of 22,000 volt, three-phase alternating current generator and feeder circuits. The generators will be star connected and will furnish cur-

rent at 22,000 volts. The d. c. exciters will furnish current at 125 volts, a portion of which will be transmitted from the power house to the switch house for switch control and lighting purposes. All cables in the power house and switch house which do not enter the ducts between the two houses will be furnished under other specifications.

2. All conductors shall be of soft drawn stranded copper wire of a high degree of conductivity and tinned when the insulation is rubber.

3. a. Kind and amount of the insulation of the various cables is specified in the cable list accompanying detailed specification.

b. All rubber insulation shall be 30% pure Para, suitably protected.

c. The insulation resistance of all cables shall be as specified in detailed specification.

4. All cable shall be lead covered.

5. To all cables shall be attached a tag giving data as to tests.

6. Care shall be taken in the installation of all cables to avoid short bends. Joints will be made only where absolutely necessary, and ends of cable after installation shall be marked by means of metal tags.

III. CABLE LISTS:

Detailed lists of cables to be furnished accompany detailed specification. The City reserves the right to increase or decrease the quantity of these cables.

DIGEST OF SECTION IX.—Q.

SPECIFICATION FOR SWITCH HOUSE EQUIPMENT FOR POWER PLANT.

I. GENERAL:

This specification covers the furnishing and erection of the complete SWITCH HOUSE EQUIPMENT to be installed in connection with the power plant.

II. REQUIREMENTS:

1. The switch house equipment is to be installed in the switch house located near the power house and will be used for receiving and distributing 22,000 volt, three-phase current. The pressure of the d. c. current used in the remote control will be 125 volts.

2. All copper and wiring connections shall be of high conductivity. Current density at contact surface shall not exceed 200 amperes per sq. inch. The ends of all conductors of each cable shall be tagged when installed. All cables shall be carefully drawn into pipes. All connections to high tension apparatus shall be made under this contract.

3. Insulation of various cables specified in attached detailed list. Paper or cambric for high tension and large cables of the low tension service and rubber for all control and instrument cables.

4. Name plates shall be furnished for each circuit and installed at the ends of cables.

5. All necessary structural work and supports for installing conductors, busses, insulators, instrument transformers, etc., shall be furnished.

III. BUS BARS:

High tension bus bars shall be of 2″ x 3/8″ copper bar. All connections to be made by means of clamps or bolts.

IV. INSULATORS:

Three part porcelain insulators shall be used for supporting high tension bus bars, supported on pins of rigid design. Each part of insulator shall stand test of 20,000 volts.

V. HIGH TENSION CONNECTIONS:

1. All high tension connections in the system between generator cable ends coming into the switch house and the feeder cable ends going out of the switch house shall be made by this Contractor, including cable bells and all necessary supports.

2. High tension conductors connecting oil switches, bus bars and current transformers shall be made of copper tubing of ample capacity, installed without buckling or flattening.

3. All cable bells and connections from cable bells to current transformers shall be furnished and installed under this contract. All high tension cables shall be tested at 44,000 volts.

4. Three part porcelain wall tubes will be installed where conductors pass through walls.

VI. OIL SWITCHES:

1. Oil switches shall be installed in the switch house, three for each generator, two for each feeder and auxiliary circuit and two for bus ties, together with necessary oil for operation and are to be of the electrically operated remote control type.

2. All necessary brickwork shall be furnished and put in place.

3. Necessary cell doors for oil switches and disconnecting switches are to be furnished.

4. Bus tie switches are to be of 600, other switches 300 ampere capacity.

5. Disconnecting switches are to be installed upon each oil switch and bus.

VII. CONDUIT FLOOR BOXES AND CABLE SUPPORTS:

1. All conduit floor boxes and cable supports required for control and instrument and power cables are to be furnished.

2. All conduit shall be of 1¼″ pipe.

3. Floor or outlet boxes shall be provided at the ends of all conduit lines.

VIII. CONTROL AND INSTRUMENT WIRING:

1. Complete control and instrument wiring shall be furnished for all instruments and switches installed.

2. The cables to be furnished under this contract for above purposes are specified in list attached to detailed specifications.

3. Terminal boards shall be provided for end of each cable.

IX. INSTRUMENT TRANSFORMERS:

1. All instrument transformers shall be furnished and installed as specified under:

a. Potential transformers 13,200—110 volts. Three for each generator, four for buses, one for each feeder.

b. Current transformers 22,000 volts. Five for each generator, three for each feeder.

c. All transformers shall be carefully adjusted for their respective instruments.

d. All transformers shall carry their full load without excessive heating.

2. Transformers shall be tested with 44,000 volts on primaries and 1,000 volts on secondaries.

3. Fuses shall be provided for high tension terminals.

X. STATIC DISCHARGERS:

Static dischargers shall be furnished for all feeder lines.

XI. GROUND CONNECTIONS:

1. Main ground buses, ground plates and auxiliary ground wire connections shall be furnished and installed for instrument control circuits.

2. There will be one main bus to which various auxiliary buses are connected. Main bus of flat bar copper.

3. Auxiliary buses shall connect to main bus through disconnecting switch and shall be of No. 4 wire. Ground wires to individual instruments may be of No. 8 wire and so arranged as to be disconnected from auxiliary bus. All bus wires to be kept as far as possible from high tension wires.

4. Two ground plates shall be furnished and installed connected to main ground bus.

XII. APPURTENANCES FOR TRANSFORMERS FOR AUXILIARY CIRCUIT:

All high tension connections shall be made to the transformer in the auxiliary circuit.

DIGEST OF SECTION IX.—R.

SPECIFICATION FOR OIL COOLED TRANSFORMER.

I. GENERAL:

This specification covers the OIL COOLED TRANSFORMER for power plant to be located in switch house in connection with the power plant installation.

II. TYPE AND CAPACITY:

Transformer is to be three-phase, designed to operate in 25 cycle circuit. Capacity to be 200 K. W.

III. PERFORMANCE:

1. Transformer is to carry its full rated load for 24-hour periods with not over 35° Centigrade rise in temperature; 125% loads for same period with not more than 45° Centigrade rise in temperature; 150% load for three hours with not over 60° Centigrade rise in temperature.

2. Efficiencies at various loads and power factors are specified in detailed specification.

IV. REQUIREMENTS:

1. Transformer is to be supplied with three-phase current, 22,000 volts, primary coils delta connected; second coils star connected to supply current at 220 volts. Transformer is to be provided with neutral tap on secondaries.

2. Transformer shall be provided with panel or terminal board for the secondary line.

3. Transformer shall contain no material that will be injured by a temperature of 95° Centigrade. The insulation resistance between the primary and the core shall be subjected to test of 45,000 volts, and between the secondary and core of 2,500 volts.

4. Steel used for core shall be of a high magnetic quality.

V. DETAILS OF CONSTRUCTION:

1. The transformer shall be contained in heavy steel tank designed to prevent any liability of danger on account of fire.

2. Oil used for insulating shall possess high insulating qualities and have high flash and burning points.

3. Extra heavy insulation shall be provided on the ends of windings.

VI. GENERAL DIMENSIONS:

Contractor shall submit general dimensions of transformer including weights of transformer and oil.

DIGEST OF SECTION X.

SPECIFICATION FOR TELEPHONE SYSTEM.

I. SCOPE OF SPECIFICATION:

This specification covers the furnishing, delivering, installing and testing of the TELEPHONE SYSTEM.

II. SIGNALING STATIONS:

(1) *Description.* Suitable jack boxes wired in multiple for plug connection with portable telephone.

(2) *Location.* Approximately every 800 ft.

(3) *Construction.* Iron, spherical in shape, moisture proof, with lock, mounted on hollow ornamental iron support at side of street.

(4) *Weight.* Jack boxes and supports approximately 200 lbs. each. Concrete bases 18"x18"x12".

III. CENTRAL SWITCHBOARD.

(1) *Description.* Wall type oak wood-work, complete with visual line signals and all necessary apparatus and wiring for operation on common battery system.

(2) *Capacity.* 50 lamp lines 5 cord equipments.

(3) *Present Equipment.* 5 lamp lines 2 single answering cords.

(4) *Future Equipments.* Facilities to be provided for future additions to line and cord equipments.

IV. AUXILIARY APPARATUS:

Necessary arrester rack, distributing board, primary batteries, etc., to be provided.

V. TELEPHONES:

Portable Telephones. Micro-telephone type, with 36" cord and plug, and suitable leather carrying case to be provided.

VI. WIRING:

(1) *Line Wiring.* To be No. 16 soft drawn copper wire, twisted pairs, encased in lead sheath 3/64" in thickness without splice or tap. To terminate at central office in combination lightning arrester rack and distributing board.

(2) *Conduits.* Cables to be laid in conduits.

(3) *Laterals.* Laterals from main holes to jack boxes to be laid in 2-inch iron pipe.

(4) *Splices.* To have proper lead sleeves of same thickness as sheath of cable, thoroughly made, wiped and filled with insulating compound.

(5) *Wiring to Switchboard.* To be No. 22 tinned copper wire, twisted pairs, one silk one cotton insulation, in 5 pair cable.

VII. METHOD OF OPERATION:

Insertion of plug in jack of jack box operates visual line signal at switchboard; operator responds by inserting plug in corresponding jack.

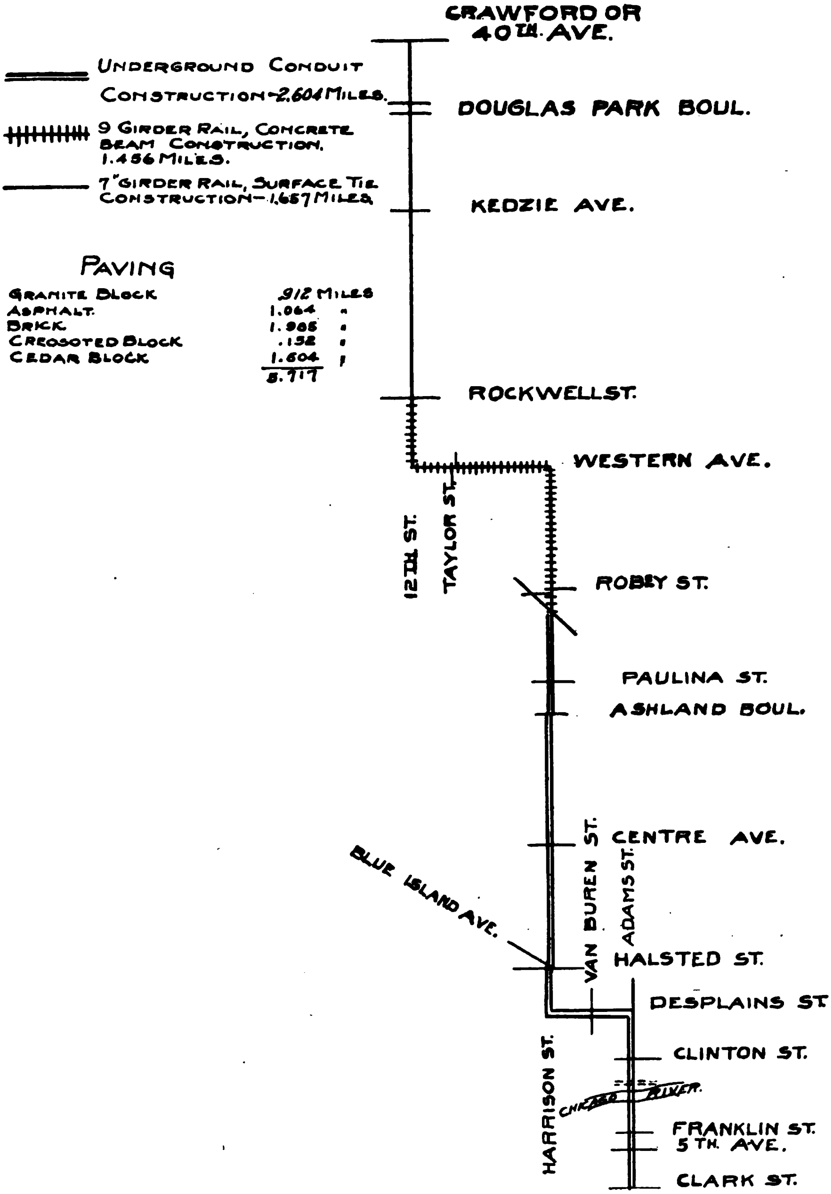


Diagram No. XI

Trunk Line
on
Adams, Harrison and 12th Streets

PART VI.

BID SHEETS.

TO THE CITY OF CHICAGO:

The undersigned has read the detailed preliminary specifications and has examined the plans for a Municipal Street Railway for the City of Chicago now on file in the office of the Commissioner of Public Works, and will build and deliver, in first-class working order, the respective kinds of work hereinafter named in such a manner as to comply with the above mentioned plans and specifications for the following amounts; it being understood that additions or slight deductions may be made from these amounts in accordance with the unit prices shown on the Unit Price Bid Sheets.

AGGREGATE BID NO. 1.

"ADAMS STREET LINE."

Complete double track railway located as follows:

On Adams St. beginning at Clark St.
Thence west on Adams St. to Desplaines St.
Thence south on Desplaines St. to Harrison St.
Thence west on Harrison St. to Western Ave.
Thence south on Western Ave. to Twelfth St.
Thence west on Twelfth St. to Fortieth St.
Total length of double track, 5.72 miles.

I. TRACK WORK:

2.353 miles of double track underground conduit construction complete as per Specification I-A, extending from Clark St. to Ogden Ave.....

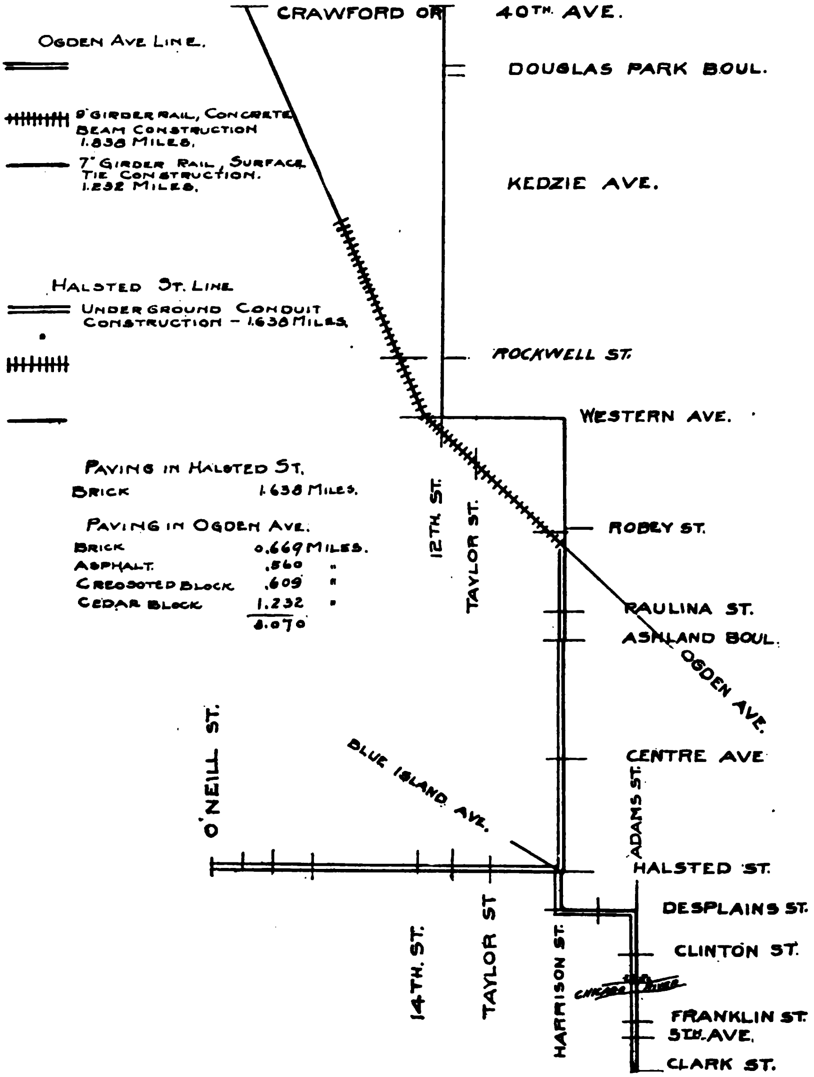


Diagram No. XII

Trunk Line with Branches
on
Halsted Street and Ogden Avenue

0.146 miles special work as per specifications referred to in Unit Price Bid Sheet, Section 1, Division D, for the different combinations required as follows:

Diagram Number.	Layout.	Location.
XIII	A	Crossovers, Adams St.
XIII	B	Adams & Fifth Ave.
XIII	C	Adams & Franklin Sts.
XIV	A	Adams & Clinton Sts.
XIV	B	Adams & Desplaines Sts.
XIV	C	Desplaines & Van Buren Sts.
XIV	D	Desplaines & Harrison Sts.
XV	A, B & C	Harrison & Halsted Sts.
XVI	A	Harrison & Center Sts.
XVI	B & C	Harrison & Ashland Ave.
XVI	D	Harrison & Paulina Sts.
XVII	B & C	Cross-over & Terminal Pit.

0.095 miles on Adams Street Bridge and Viaduct as per specifications I-E and Drawing No. 26.

1.412 miles of double track surface, concrete beam construction complete as per Specification I-B, extending from Ogden Ave. to 12th St. and Rockwell Street.......................$————

0.058 miles of special work as per specifications referred to in Unit Price Bid Sheet, Section 1, Division D, for the different combinations required as follows:

Diagram Number.	Layout.	Location.
XVII	A	Harrison & Ogden Ave.
XVIII	A	Harrison & Robey Sts.
XVIII	B	Harrison & Western Ave.
IX	A	Western & 12th St.

1.642 miles of double track surface, tie construction complete as per Specification I-C, extending from 12th St. and Rockwell St. to 40th Ave. ....$————

Special work as per specifications and drawings referred to in Division "D," "Section I" "Unit price bid sheet," for the different combinations required as follows:

0.014 miles of special work as per specifications and drawings referred to in Unit Price Bid Sheet, Section 1, Division D, for the following layout:

Diagram No. IX., Layout B, Crossovers, 12th St. and 40th Ave.

5.72 miles total length double track.

Bid on Track Work..................$————

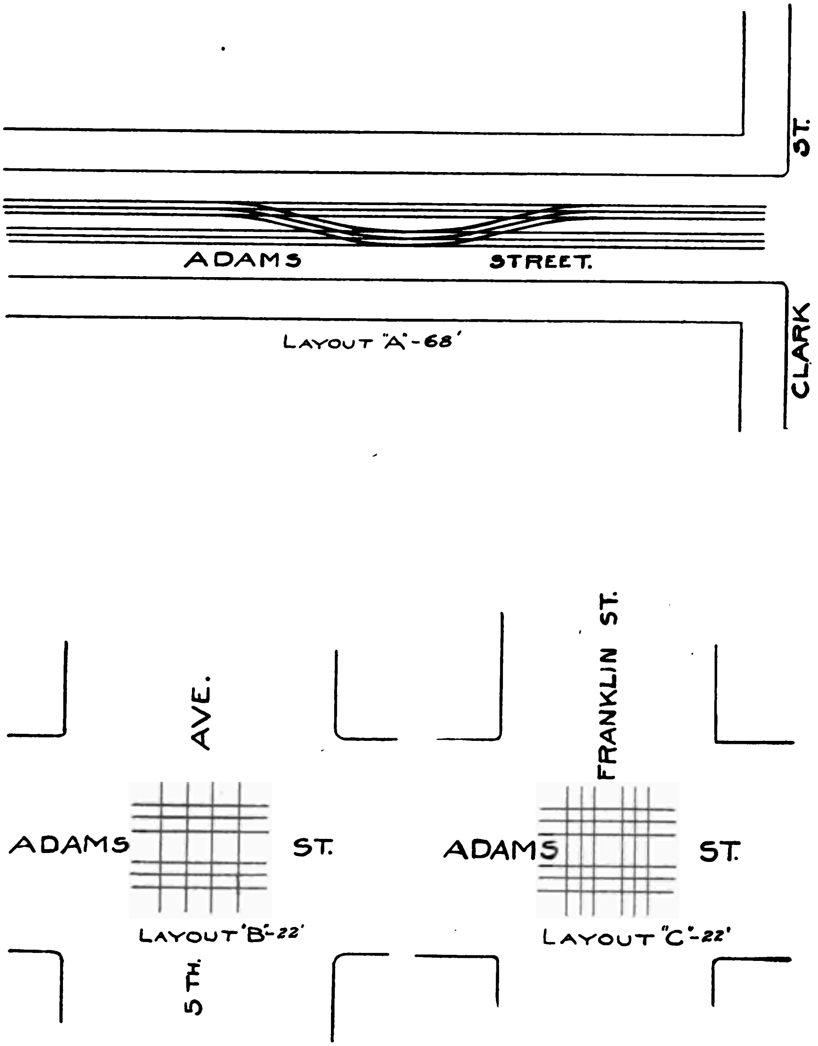


Diagram No. XIII

Track Special Work

"Adams Street Line."

II. PAVING:

All for double track.

.912 miles *Granite Block,* as per Specification II-A.
1.064 miles *Asphalt,* as per Specification II-B.
1.985 miles *Brick,* as per Specification II-C.
.152 miles *Creosoted Wood Blocks,* as per Specification II-D.
1.607 miles *Cedar Block,* as per Specification II-E.

Bid on Paving ....$————

III. CONDUIT FOR ELECTRIC CABLES:

Specification III-A-B.

There will be required conduit as follows, pavement to be temporarily replaced as specified:

	Under Granite (Ft.)	Under Brick. (Ft.)	Under Asphalt. (Ft.)	Under Cedar (Ft.)
Four duct.....	——	——	1000	4500
Six duct.......	——	1000	1000	3400
Eight duct.....	1500	——	——	——
Twelve duct...	1200	1800	3900	300
Sixteen duct...	2200	5900	1000	——
Twenty duct...	——	1500	——	——

40 Manholes complete; size 5′ x 5′
35 Manholes complete; size 6′ x 6′
20 Laterals, for trolley taps, each consisting of 15 ft. of 2″ iron pipe, including one pipe bend.
38 Laterals for telephone system, same.
2,000 Split tile bends in place upon cables in manholes.
2,000 Duct feet straight split tile in place upon cables in manholes.

Bid on Conduit......................$————

IV. UNDERGROUND ELECTRIC CABLES:

Specifications IV-A-B.

All cable in place with joints made.

40,000′ of 500,000 c. m. 650 volt cable.
57,000′ of 1,000,000 c. m. 650 volt cable.

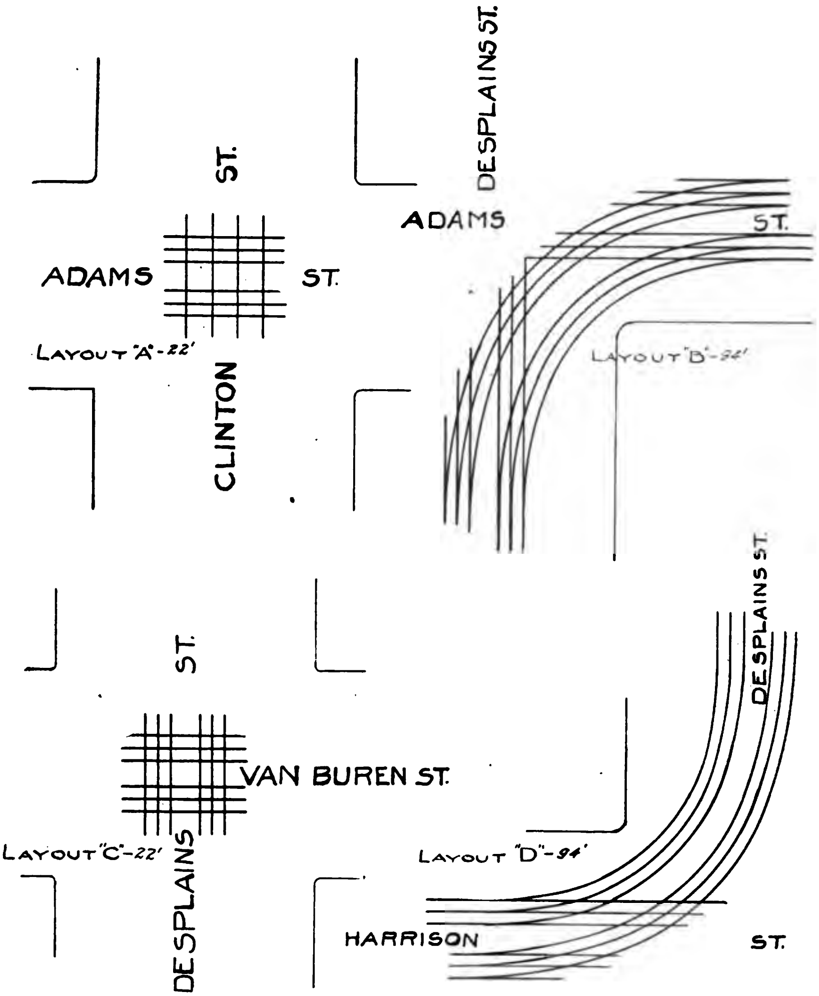


Diagram No. XIV
Track Special Work
"Adams Street Line"

54,000′ of 1,500,000 c. m. 650 volt cable.
70 Taps in manhole for connection to conductor rails.
20 Taps for overhead trolley.

NOTE:—Four 500′ lengths of the above 1,000,000 c. m. cables will be installed in tunnel to be provided under the Chicago river. Assume that vertical shafts will be 75 feet each, with 350 feet horizontal bore.

Bid on Cables........................$———–

V. OVERHEAD WORK: Specification V—A-B-C.

2.96 miles cross suspension construction.
Special work as follows:
A. Robey street crossing.
B. Two curves, double track.
C. Rockwell street viaduct.
D. Terminals.

Bid on Overhead Work................$————

VI. SUB-STATION EQUIPMENT:

Specification VI. A-B-C-D-E-F.
Sub-Station No. 1, consisting of the following:
2 Switch equipments for receiving two high tension transmission lines.
2 1000 K. W. rotary converter units.
1 500 K. W. rotary converter unit.
2 Blower sets complete.
1 15 K. W. motor generator set and battery.
2 Tie feeder panels for 1500 amperes.
1 Tie feeder panel for 1000 amperes.
4 Conduit feeder panels for 1000 amperes.
4 Conduit feeder panels for 500 amperes.
1 Panel for light and power.
High tension bus as specified.
Foundations, wiring ducts, conduits and buildings furnished under separate section.

Bid on one Sub-Station Equipment.....$————

VII. ROLLING STOCK: Specification VII. A-B-C.

50 Standard passenger cars.
1 Sweeper.

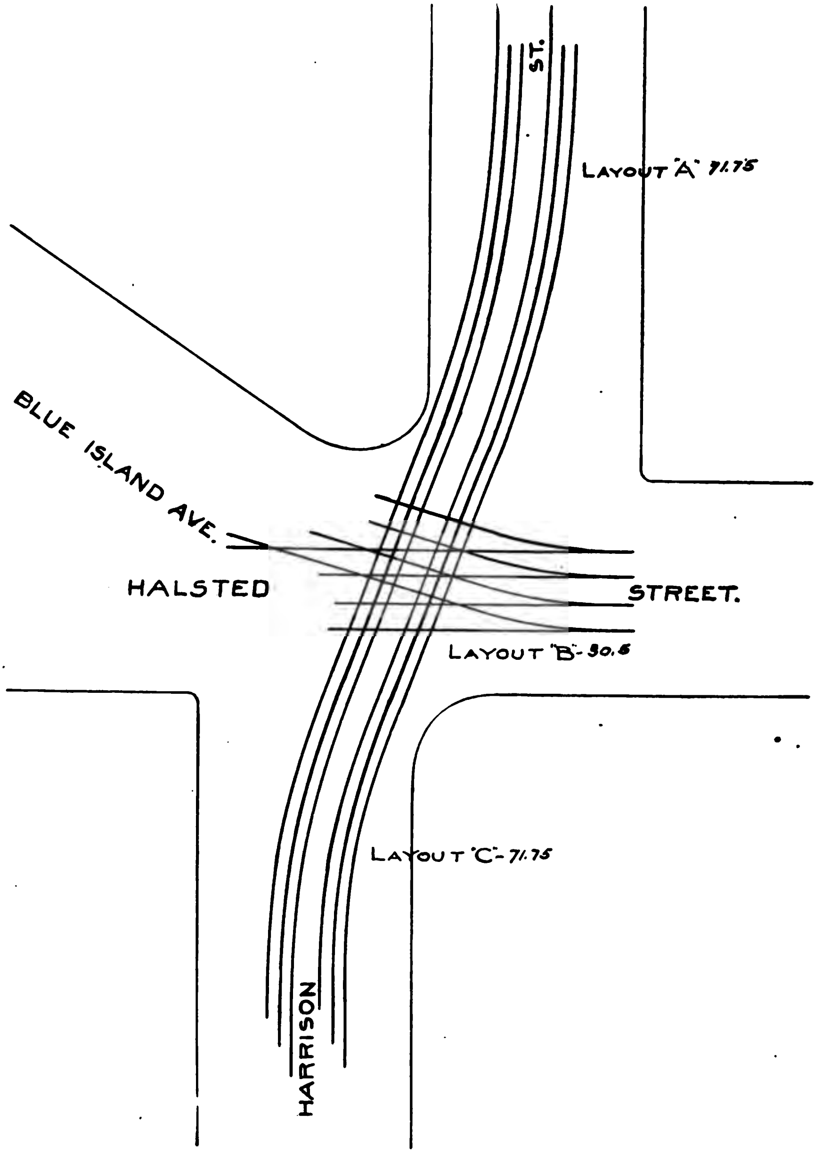


Diagram No. XV

Track Special Work

"Adams Street Line."

1 Repair car.
1 Snow plow.
1 Sprinkler.
1 Repair wagon.
50 Contact plows.
Bid on Rolling Stock.................. .$————

VIII. BUILDINGS: Specification VIII. A-B-C-D.

The following amounts for buildings are to be included i this bid:

(See Unit Bid Sheet for conditions.)
A. One car barn and equipment.....$65,000
B. Repair shop and equipment.
(See Aggregate Bid No. 4.)
C. One sub-station building......... 16,000
D. Power plant building.
(See Aggregate Bid No. 4.)
Bid on one Car House and one Sub-station.$ 81,00

IX. POWER PLANT EQUIPMENT:

(See Aggregate Bid No. 4.)

X. TELEPHONE SYSTEM: Specification X—A-B.

38 jack boxes and supports complete in place.
30800′ Single twisted pair No. 16 conductor paper. insulated lead covered cable in place with joints.
1 Common battery wall-type telephone switchboard, oak woodwork, capacity 50 lines, 5 cord equipments, equipped with 5 lines 2 cord equipments.
Arrester rack distributing board, primary batteries and necessary wiring.
50 portable telephones, microtelephone type, with 36″ cord and plug complete with leather carrying cases.
Bid on Telephone System................$————

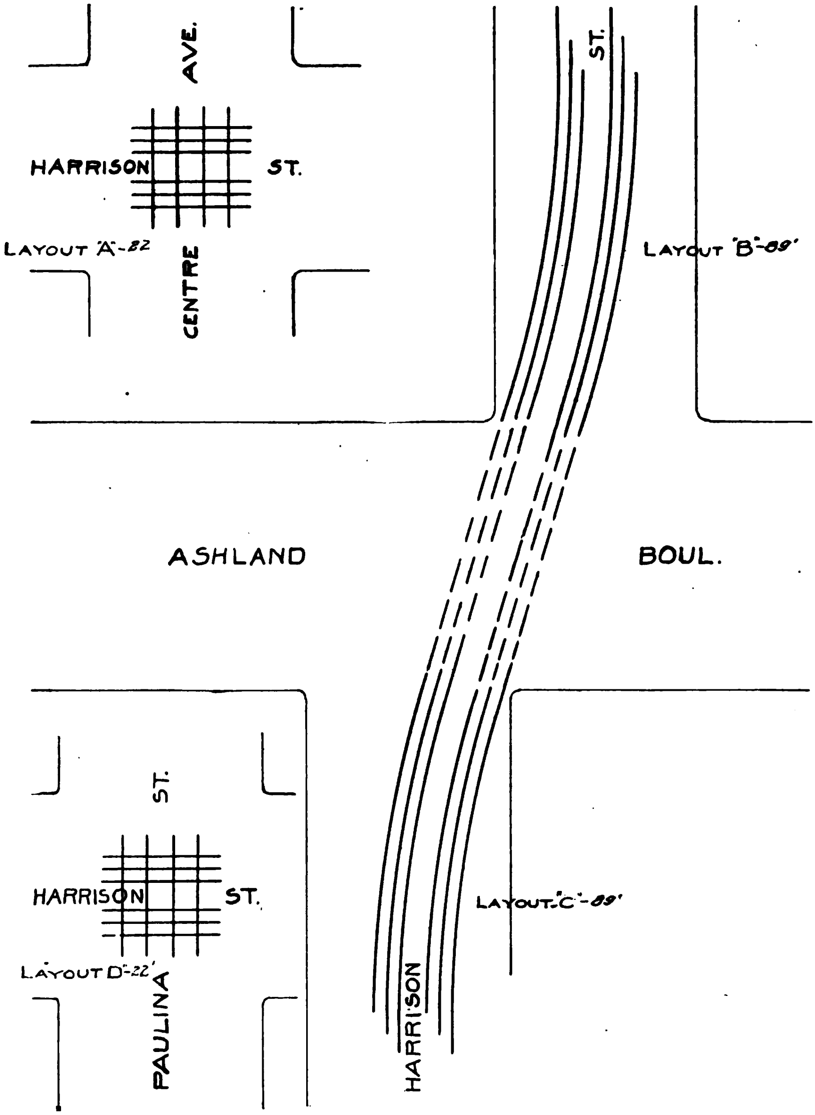


Diagram No. XVI
Track Special Work
"Adams Street Line."

RECAPITULATION.

Aggregate Bid No. 1.

I.	Track work	$————
II.	Paving	$————
III.	Conduit	$————
IV.	Cables	$————
V.	Overhead work	$————
VI.	Sub-station equipment	$————
VII.	Rolling stock	$————
VIII.	Buildings	$ 81,00
IX.	Power plant equipment (omit)	
X.	Telephone system	$————
	Total Bid for Adams St. Line	$————

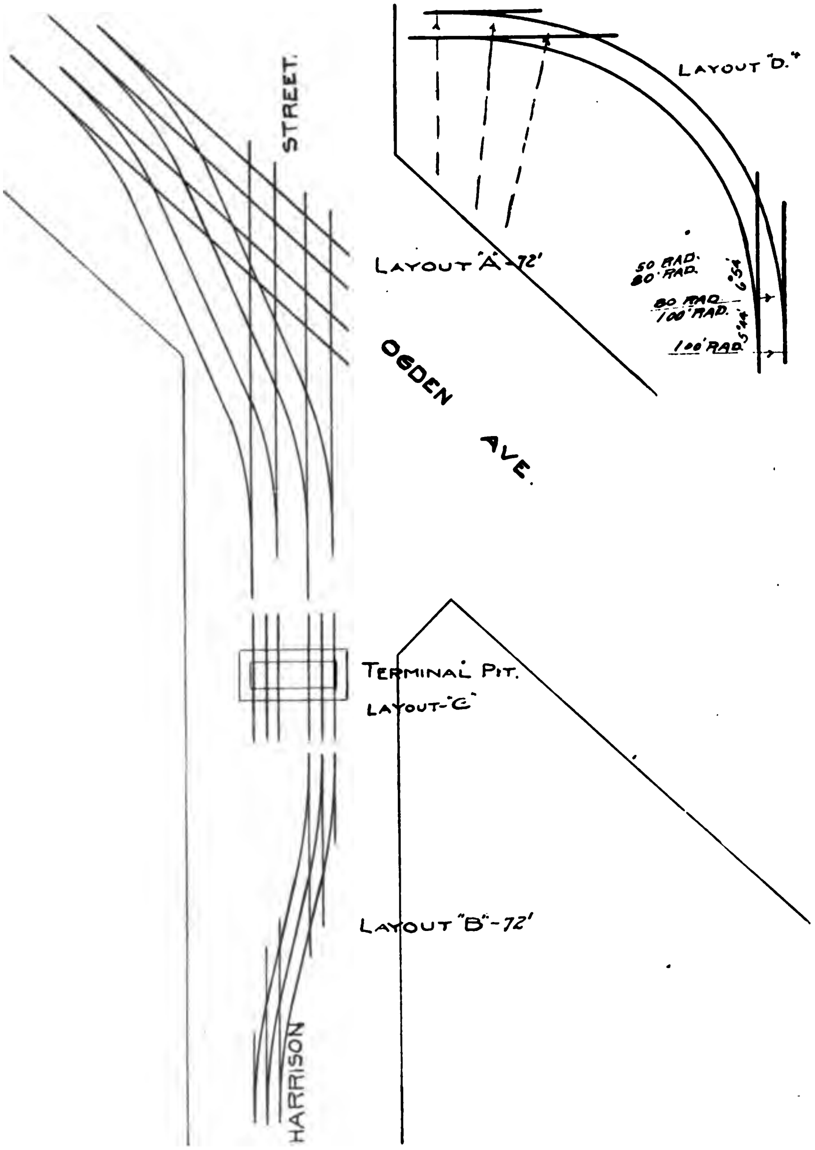


Diagram No. XVII
Track Special Work
"Adams Street Line."

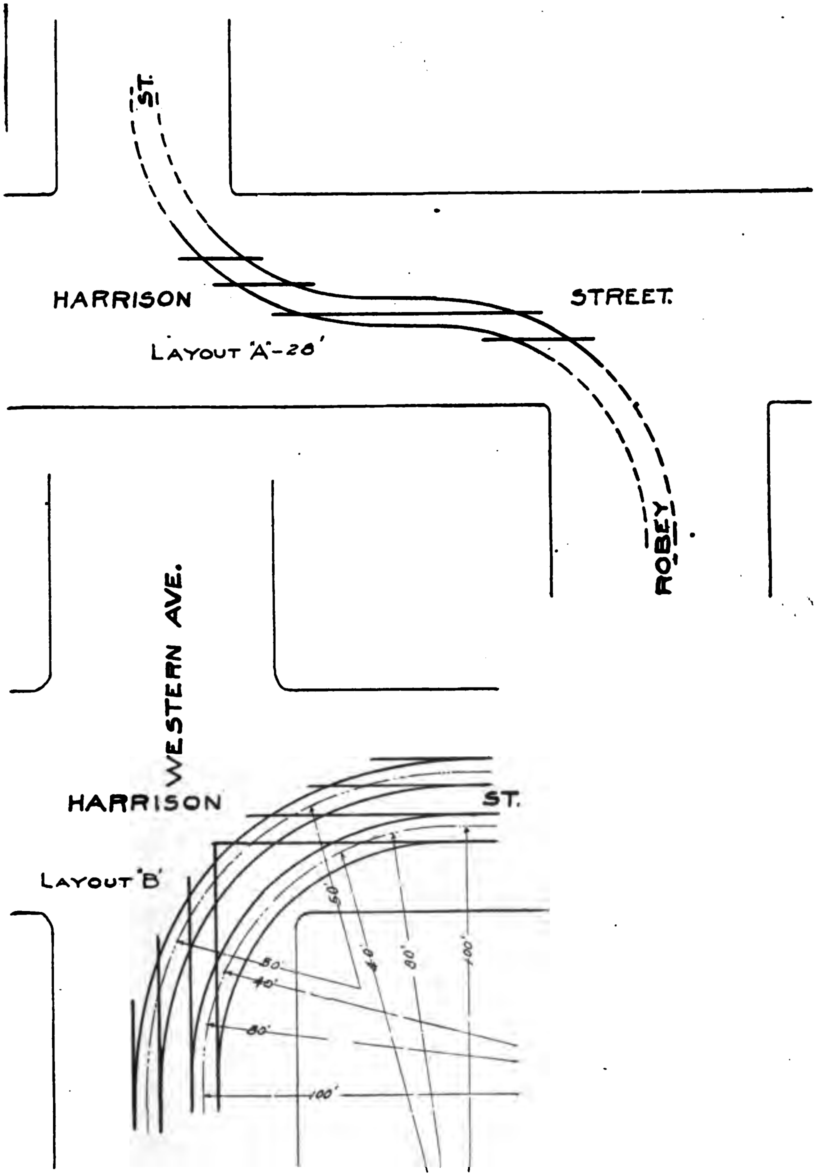


Diagram No. XVIII
Track Special Work
"Adams Street Line."

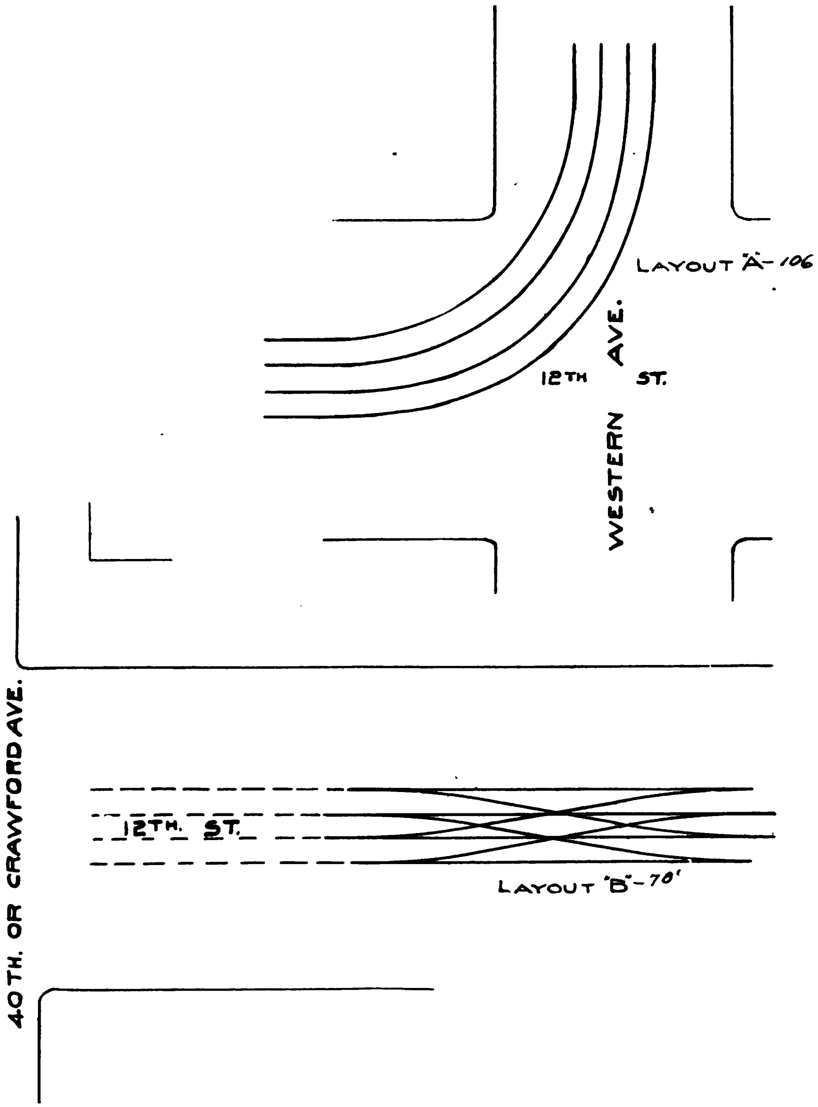


Diagram No. XIX
Track Special Work
"Adams Street Line."

AGGREGATE BID NO. 2.

"HALSTED STREET LINE."

The additional price for equipping the double track railway south on Halsted Street, from Harrison Street to the south branch of the Chicago River, will be as follows:

I. TRACK:

1.597 miles of double track underground conduit construction as per Specification I-A.

0.041 miles of special work as per specifications referred to in Unit Price Bid Sheet, Section 1, Division D, for the different combinations of special work called for as follows:

Diagram number.	Layout.	Location.
XXI	C	Halsted & Harrison Sts.
XX	C	Halsted & Taylor Sts.
XX	A	Halsted & 12th Sts.
XX	B	Halsted & 14th Sts.
XXI	A	Halsted & 22d. Sts.
XXI	B	Halsted & 22d Sts.
XXI	D	Crossover, O'Neil St.

Bid for Track..............................$————

Note:—Halsted Street Viaduct is to be replaced by a subway and the distance is included in the above underground conduit construction.

II. PAVING:

1.638	miles double track brick paving.

Bid for Paving..........................$————

III. CONDUIT FOR ELECTRIC CABLES:

8450′	six duct conduit under brick pavement.
14	laterals for telephone taps, each consisting of 15 feet 2″ iron pipe, including one pipe bend.
250	split tile bends in place upon cables in manholes.
250	duct feet straight split tile in place upon cables in manholes.

Bid for Conduit.......................$————

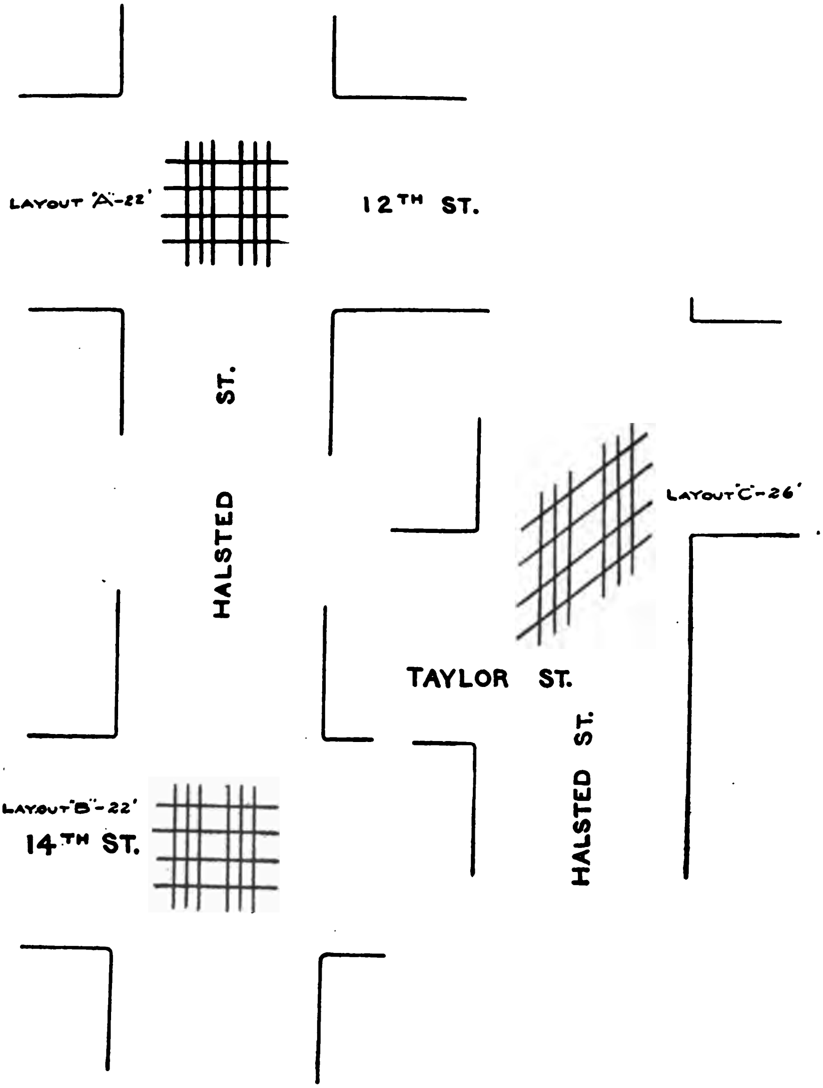


Diagram No. XX
Track Special Work
"Halsted Street Line."

IV. UNDERGROUND ELECTRIC CABLES:

All cable in place with joints made.

26000′ 500,000 c. m. 650-volt cable.

42 taps in manhole for connection to conductor rails.

Bid for Cables........................$————

V. OVERHEAD WORK: (None required.)

VI. SUB-STATION EQUIPMENT:

1 1000 K. W. rotary converter unit.

2 500 ampere conduit feeder panels.

Bid for Sub-station Equipment............$————

VII. ROLLING STOCK:

25 passenger cars.

1 sweeper.

25 contact plows.

Bid for Rolling Stock..................$————

VIII. BUILDINGS:

1 car house (allow as before).............$ 65,000

IX. POWER PLANT EQUIPMENT:

(See Aggregate Bid No. 4.)

X. TELEPHONE SYSTEM:

10 jack boxes and supports complete in place.

8800′ single twisted pair No. 16 conductor paper insulated lead covered cable, in place with joints.

25 portable telephones, microtelephone type, with 36″ cord and plug, complete with leather carrying cases.

Bid for Telephone System..............$————

Total for Aggregate Bid No. 2....$——————

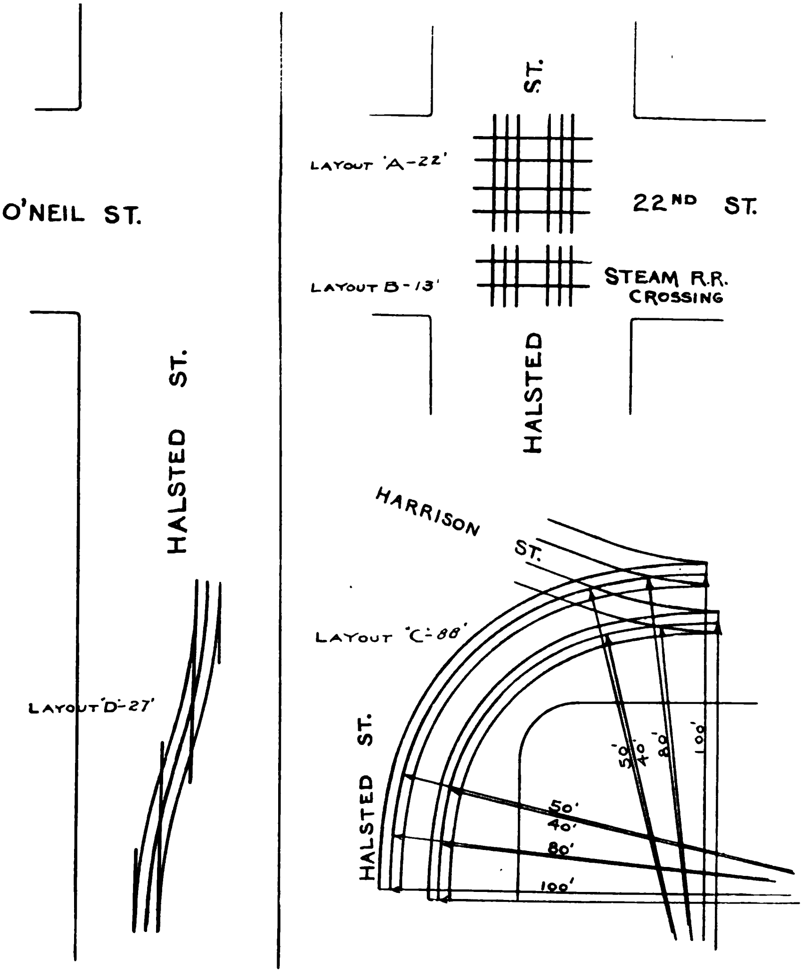


Diagram No. XXI
Track Special Work
"Halsted Street Line."

AGGREGATE BID NO. 3.

"OGDEN AVE. LINE."

The additional price for equipping the double track railway on Ogden Avenue, from its intersection with Harrison Street to 40th (Crawford) Avenue, will be as follows:

I. TRACK:

1.810 miles double track, surface conduit beam construction as per Specification I-B.

0.028 miles of special work as per specification referred to in Unit Price Bid Sheet, Section 1, Division D, for the different combinations of special work called for as follows:

Diagram Number.	Layout.	Location.
XXII	A	Ogden & Robey Sts.
XXII	B	Ogden & Taylor Sts.
XXII	C, D, E, F, G and H.	Ogden & 12th Sts.
XXIII	A & B	Ogden & Western Aves.

1.218 miles double track, surface tie construction, as per specification I-C.

0.014 miles of special work, as per specifications referred to in Unit Price Bid Sheet, Section 1, Division D, for the different combinations of special work called for as follows:

Diagram Number.	Layout.	Location.
XXIII	C	Ogden & 22d Sts.
XXIII	D	Crossover 40th St.

Bid for Track.........................$———

II. PAVING:

All paving for double track.

.560	miles asphalt.
.669	miles brick.
.609	miles creosoted wood block.
1.232	miles cedar block.

Bid for Paving.....................$————

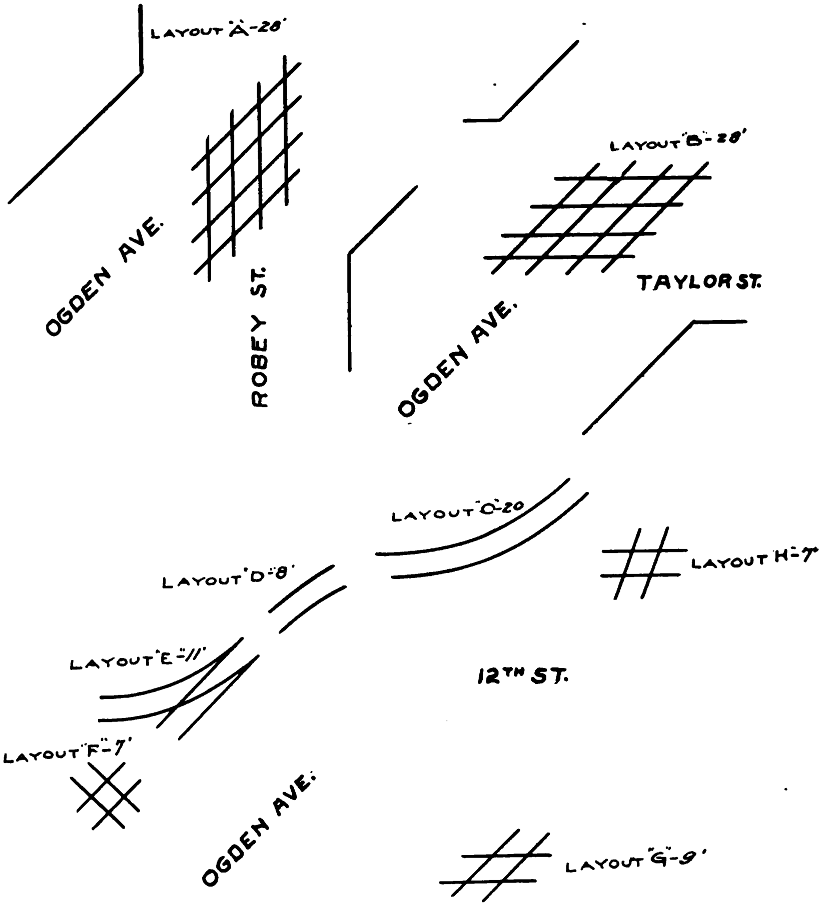


Diagram No. XXII
Track Special Work
"Ogden Ave. Line."

III. CONDUIT FOR ELECTRIC CABLES:

	Under Asphalt. Ft.	Under Brick. Ft.	Under Cedar Ft.	No Pavement. Ft.
Four duct	1400	——	6900	300
Six duct	1600	3500	3500	—

43 manholes complete, size 5′ x 5′.

22 laterals for trolley taps, each consising of 15 feet 2″ iron pipe, including one pipe bend.

22 laterals for telephone taps, same.

300 split tile bends in place upon cables in manhole.

300 duct feet straight split tile in place upon cables in manhole.

Bid for Conduit........................$————

IV. UNDERGROUND ELECTRIC CABLE:

All cables in place with joints made.

26000′ 500,000 c. m. 650 volt cable.

Note: Two 500,000 c. m. cables will cross the viaduct attached to structure; allow 470′ for length of viaduct.

22 taps to overhead trolley.

Bids for Cables........................$————

V. OVERHEAD WORK:

2.32 miles side pole cross suspension construction.

1.38 miles side bracket construction for single track.

Branch off at Harrison St.

Double track crossings at Robey St., Taylor St., 12th St., Western Ave. and 22d St.

Viaduct construction on Ogden Ave. bridge.

Trolley runways under elevated R. R. crossing.

Terminal.

Feeder taps as specified.

Bid for Overhead Work................$————

VI. SUB-STATION EQUIPMENT:

For sub-station No. 2.

(Same as in Aggregate Bid No. 1.)

Bid for Sub-station Equipment..........$————

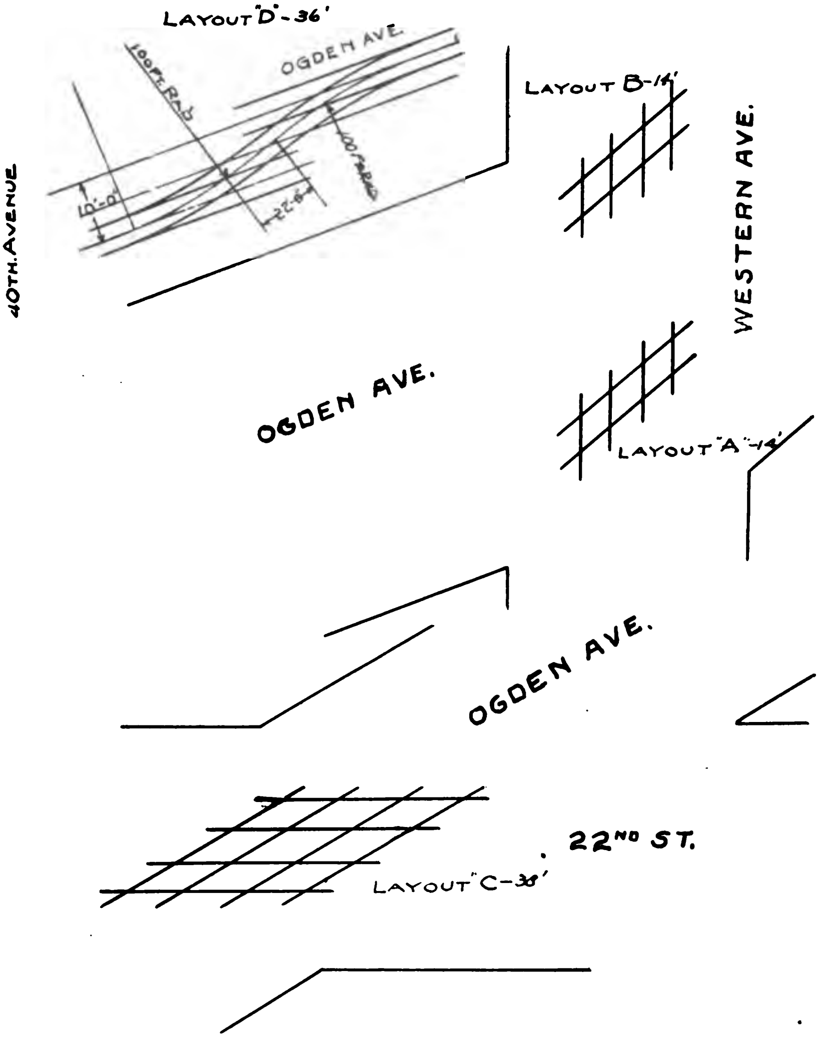


Diagram No. XXIII
Track Special Work
"Ogden Ave. Line."

VII. ROLLING STOCK:

25 passenger cars.
1 sweeper.
1 repair wagon.
25 contact plows.
Bid for Rolling Stock....................$————

VIII. BUILDINGS: (See unit prices.)

One car house and equipment (allow $65,000).
One sub-station building and crane (allow $16,000).
Bid for Buildings........................$ 81,000

IX. POWER PLANT EQUIPMENT:

(See Aggregate Bid No. 4.)

X. TELEPHONE SYSTEM:

22 jack boxes and supports complete in place.
24900′ single twisted pair No. 16 conductor paper insulated lead covered cable in place with joints.
25 portable telephones, microtelephone type, with 36″ cord and plug complete with leather carrying cases.
Bid for Telephone System..............$————

Total for Aggregate Bid No. 3..$————————

AGGREGATE BID NO. 4.

POWER PLANT EQUIPMENT AND BUILDING, TRAN MISSION CIRCUITS TO SUB-STATIONS, CAR REPAIR SHOPS AND EQUIPMENT.

IX. POWER PLANT EQUIPMENT:

Specifications IX.—A to R inclusive.

2 3000 K. W. turbo-generator units, complete with condensers.
1 100 K. W. turbo-exciter.
1 100 K. W. induction motor exciter.
8 500 H. P. water tube boilers with stokers.
Feed pumps in duplicate and one heater for each turbo-unit.

Bidder shall include in his bid $70,000 for piping, the details of which will be prepared by the Engineer after equipment is selected and building site secured, it being understood that the conditions governing the bids for buildings will govern also those for 'piping.'

Switch equipment to include all necessary control apparatus for two turbo-units and auxiliaries and for four transmission lines and one auxiliary circuit.

Lighting for building, wire ducts and conduits are to be included under separate section.

Note.—Bidder may make his proposal upon compound reciprocating engines and other types of boilers or stokers if he so desires.

Bid on power plant equipment..........$———

VIII. POWER PLANT BUILDING:

Including crane, chimney, breeching, coal and ash handling equipment. Specification VIII-D.

See Unit Bid for conditions under which bidder is to include $160,000 in his bid for this building.

II. CONDUIT FOR ELECTRIC CABLES:

For transmission circuits.

		Under Cedar Block Pavement.
	Four duct	11000′
	Eight duct	5000′
14	Manholes, complete, size 6′ x 6′.	
28	Manholes, complete, size 5′ x 5′.	
450	Split tile bends in place upon cables in manhole.	
450	Duct feet straight split tile in place upon cables in manhole.	

V. UNDERGROUND ELECTRIC CABLES:

All cables in place with joints made.

22,000′	2/0 3 conductor 22,000 volt cable.
22,000′	1/0 3 conductor 22,000 volt cable.

III. REPAIR SHOP AND EQUIPMENT:

Specification VIII-B.

See Unit Bid for conditions under which bidder is include $140,000 in his bid for these buildings.

RECAPITULATION AGGREGATE BID NO. 4.

Bid for power plant equipment	$————
Bid for power plant building	$ 160,000
Bid for transmission lines	$————
Bid for repair shop and equipment	$ 140,000
	———
Total for Aggregate Bid No. 4	$——————

SUMMATION OF AGGREGATE BIDS.

No. 1.	Adams St. line	$————
No. 2.	Halsted St. line	$————
No. 3.	Ogden Ave. line	$————
No. 4.	Power plant, transmission lines and repair shop	$————

Total of all Aggregate Bids ....$—————

Signed ....

....
Bidder.

UNIT PRICE BID SHEET.

Such additional construction as the City may require will be built for the following prices, which amounts may also be used for slight deductions or alterations:

SECTION I.

TRACK WORK.

A UNDERGROUND CONDUIT CONSTRUCTION:
2.62 or more miles of double track underground conduit electric railway complete, exclusive of paving, as per Specification I-A, per mile ....$————

B SURFACE CONCRETE BEAM CONSTRUCTION:
1.35 or more miles of double track electric railway with overhead conductor complete, exclusive of paving, as per Specification I-B, per mile ....$————

C SURFACE TIE CONSTRUCTION:
1.75 or more miles of double track electric railway with overhead conductor complete, exclusive of paving, as per Specification I-C, per mile ....$————

D TRACK SPECIAL WORK:

1. CROSSINGS APPROXIMATING 90 DEGREES:
   - (a) Double track underground conduit crossing double track underground conduit, in place, without paving, as per Specifications I-A and I-D and Drawing No. 18..........................$————
   - (b) Double track underground conduit crossing single track underground conduit, in place, without paving, as per Specifications I-A and I-D and Drawing No. 18..........................$————

(c) Single track underground conduit crossing single track underground conduit, in place, without paving, as per Specification I-A and I-D and Drawing No. 18 .... $————

(d) Double track underground conduit crossing double track surface construction, in place, without paving, as per Specifications I-A and I-D and "Note" on Drawing No. 19.......... $————

(e) Double track underground conduit crossing single track surface construction, in place, without paving, as per Specifications I-A and I-D and "Note" on Drawing No. 19.................. $————

(f) Single track underground conduit crossing single track surface construction, in place, without paving, as per Specifications I-A and I-D and "Note" on Drawing No. 19..................... $————

(g) 9″ girder groove rail single track crossing single track, in place, without paving, as per Specifications I-B and I-D .... $————

(h) 7″ girder guard rail single track crossing single track, in place, without paving, as per Specifications I-C and I-D .... $————

2. CROSSINGS APPROXIMATING 40 TO 60 DEGREES:

(a) Double track underground conduit crossing double track underground conduit, in place, without paving, as per Specifications I-A and I-D and Drawing No. 19.......................... $————

(b) Double track underground conduit crossing single track underground conduit, in place, without paving, as per Specifications I-A and I-D and Drawing No. 19.......................... $————

(c) Single track underground conduit crossing single track underground conduit, in place, without paving, as per Specifications I-A and I-D and Drawing No. 19 ....$————

(d) Double track underground conduit crossing double track surface construction, in place, without paving, as per Specifications I-A and I-D and "Note" on Drawing No. 19...........$————

(e) Double track underground conduit crossing single track surface construction, in place, without paving, as per Specifications I-A and I-D and "Note" on Drawing No. 19...................$————

(f) Single track underground conduit crossing single track surface construction, in place, without paving, as per Speciciations I-A and I-D and "Note" on Drawing No. 19.....................$————

(g) 9″ girder groove rail single track crossing single track, in place, without paving, as per Specifications I-B and I-D ....$————

(h) 7″ girder guard rail single track crossing single track, in place, without paving, as per Specifications I-C and I-D ....$————

3. BRANCHOFF CURVES APPROXIMATING 90 DEGREES:

(a) Double track connecting underground conduit branchoff curves, in place, without paving, as per Specifications I-A and I-D and Drawings No. 21-22-23........$————

(b) Double track underground conduit branchoff curves, in place, without paving, as per Specifications I-A and I-D and Drawings No. 21-22-23............$————

(c) Single track connecting underground conduit branchoff curve, in place, without paving, as per Specifications I-A and I-D and Drawings No. 21-22-23.......$-----

(d) Single track underground conduit branchoff curve, in place, without paving, as per Specifications I-A and I-D and Drawings No. 21-22-23............$-----

(e) Double track 9″ guard rail concrete beam connecting branchoff curves, in place, without paving, as per Specifications I-B and I-D and Diagram XVIII, Layout "B" ....$-----

(f) Double track 9″ guard rail concrete beam branchoff curves, in place, without paving, as per Specifications I-B and I-D and Diagram XIV, Layout "D" ....$-----

(g) Single track connecting 9″ guard rail concrete beam branchoff curves, in place, without paving, as per Specifications I-B and I-D and Diagram XVII, Layout "D" ....$-----

(h) Single track 9″ guard rail concrete beam branchoff curve, in place, without paving, as per Specifications I-B and I-D and Diagram XXII, Layout "E"..$-----

(i) Double track connecting 7″ guard rail tie construction branchoff curves, in place, without paving, as per Specifications I-C and I-D and Diagram XVIII, Layout "B" ....$-----

(j) Double track branchoff curves 7″ guard rail tie construction, in place, without paving, as per Specifications I-C and I-D and Diagram XIV, Layout "D"..$-----

(k) Single track connecting branchoff curves 7″ guard rail tie construction, in place, without paving, as per Specifications I-C and I-D and Diagram XVII, Layout "D" ....$————

(l) Single track branchoff curve 7″ guard rail tie construction, in place, without paving, as per Specifications I-C and I-D and Diagram XXII, Layout "E"..$————

4. PLAIN CURVES:

(a) Underground conduit plain curve track, in place, without paving, as per Specifications I-A and I-D and " Note" on Drawing No. 19, per foot of single track ....$————

(b) 9″ girder guard rail plain curve concrete beam construction, in place, without paving, as per Specifications I-B and I-D, per foot of single track......$————

(c) 7″ girder guard rail plain curve tie construction, in place, without paving, as per Specifications I-C and I-D, per foot of single track ....$————

5. CROSSOVERS:

(a) Underground conduit crossover, in place, without paving, as per Specifications I-A and I-D and Drawings No. 22-23-25, each..........................$————

(b) 9″ girder guard rail crossover, in place, without paving, as per Specifications I-B and I-D and Diagram XXIII, Layout "D" each......................$————

(c) 7″ girder guard rail crossover, in place, without paving, as per Specifications I-C and I-D and Diagram XXIII, Layout "D" each......................$————

6. JOINTS:

As per Specification I.
Unit price per joint as follows:

	7″ Rail.	9″ Rail.
Cast welded	$————	$————
Electrically welded	$————	$————
Thermit	$————	$————
Bolted	$————	$————

7. Unit price per cubic yard of concrete, as per Specification I., in place, in connection with track work............$————

8. For each thousand hard burned "sewer" brick laid with cement mortar in vault, manhole or track construction.......$————

9. Special work on Adams Street bridge and viaduct, without paving, as per Specification I-E and Drawings No. 3, 5 and 26.........................$————

SECTION II.

PAVING.

Unit prices per square yard as follows:

A. Granite, Specifications II-A, per square yard....$————

B. Asphalt, Specifications II-B, per square yard....$————

C. Brick, Specifications II-C, per square yard....$————

D. Creosoted wood block, Specifications II-D, per square yard....$————

E. Cedar blk., Spec'tions II-E, per square yard....$————

SECTION III.

CONDUIT FOR ELECTRIC CABLES.

SPECIFICATION III.—A, B, C.

Unit price per lineal foot of conduits in place, exclusive of manholes, under paving as follows:

Conduit Sections.	Granite Block.	Asphalt.	Brick.	Cedar Block.	No Pavem't.
Four Duct.	......	......	......	......	......
Six Duct.	......	......	......	......	......
Eight Duct.	......	......	......	......	......
Nine Duct.	......	......	......	......	......
Twelve Duct.	......	......	......	......	......
Sixteen Duct.	......	......	......	......	......
Twenty Duct.	......	......	......	......	......

Unit prices upon the following complete in place:

Excavation, per cubic yard.........................$————

Concrete, per cubic yard..........................$————

Manhole, complete, size 5′ x 5′, per manhole.........$————

Manhole, complete, size 6′ x 6′, per manhole........$————

Lateral duct of 2″ iron pipe, per duct foot.........$————

Lateral duct of 3½″ tile, per duct foot............$————

2″ iron pipe bends for lateral, per bend............$————

3½″ tile bends for lateral, per bend..............$————

3½″ split tile bends on cables in manholes, each.....$————

3½″ split tile straight on cables in manholes, per duct foot ....$————

Also prices upon following delivered but not laid:

3½″ single tile duct, per 1,000 duct feet.............$————

3½″ split tile duct, per 1,000 duct feet..............$————

3½″ split tile bends, per bend......................$————

SECTION IV.

UNDERGROUND ELECTRIC CABLES.

SPECIFICATION IV.—A. B. C.

Unit prices according to the following schedule:

ITEM	650 VOLT CABLE			22,000 VOLT CABLE	
	500,000 c. m.	1,000,000 c. m.	1,500,000 c. m.	No. 00	No. 0
Per lineal foot of cable in place without joints					
Each joint complete					
Each tap to conductor rail complete with cable and terminals				No taps	No taps
Each tap for trolley complete with cable and terminals				No taps	No taps
Cable on reels delivered at work					
Allowance for reels. Contractor to take them from the work					

SECTION V.

OVERHEAD WORK.

SPECIFICATIONS V.—A, B, C.

Unit prices as follows:

One mile double track, side pole, cross suspension construction, complete ....$————

One mile single track, side pole bracket construction, complete ....$————

Double track crossings, each......................$————

Double track curves, each.........................$————

Terminal anchorage, each..........................$————

Iron poles in place, each.........................$————

SECTION VI.

SUB-STATION EQUIPMENT.

SPECIFICATIONS VI.—A, B, C, D AND E.

Unit prices on equipment but not including building, foundations or crane, as follows:

A. One 1,000 K. W. unit complete in place, consisting of:
 1—1,000 K. W. rotary converter.
 3—375 K. W. transformers, oil switches, panels, wiring and connections from high tension a. c. bus to d. c. feeder bus................$————

B. One 500 K. W. unit complete as above..........$————

C. One switch equipment for transmission line, including oil switch with panel and all wiring and connections from line to high tension bus......$————

D. One d. c. trolley feeder panel for 1,000 amperes..$————

E. One d. c. conduit feeder panel for 1,000 amperes..$————

F. One d. c. feeder panel for 1,500 amperes.....$————

G. One d. c. conduit feeder panel for 1,500 amperes..$————

H. One panel for light and power in station.....$————

I. One 15 K. W. motor generator set complete with battery and panels...........................$————

J. One induction motor driven blower set.........$————

SECTION VII.

ROLLING STOCK.

SPECIFICATION VII.—A, B.

Unit prices on following equipment:

A. Standard passenger car, complete with trucks, brakes, electrical equipment and all fittings, each ....$—

B. Street sweeper, each ....$—————

C. Snow plow, each..............................$—————

D. Street sprinkler, each ....$—————

E. Repair wagon, each............................$—————

F. Contact plow, each............................$—————

G. Work car, each..............................$—————

SECTION VIII.

BUILDINGS.

SPECIFICATION VII.—A, B, C, D.

The plans and specifications for the car barns, repair shop, sub-stations and power station buildings cannot be prepared in detail until the exact locations have been determined and the equipment selected. The bidder in making his aggregate bid complete will include the following amounts, it being understood that the City reserves the right to deduct these amounts from the contract price and construct the buildings itself, through other contractors if it so elects, after the Engineer has completed the detailed plans and specifications:

A.	One car house and equipment.........$	65,000
B.	Repair shop and equipment............$	140,000
C.	One sub-station building, including crane, but not sub-station equipment...........$	16,000
D.	Power plant building and switch house, including foundations, bus bar compartments, crane, chimney, breeching and coal and ash handling equipment......$	160,000

SECTION IX.

POWER PLANT EQUIPMENT.

SPECIFICATION IX (A TO M, INCLUSIVE).

Unit prices on the following apparatus, erected in running order:

A. 3,000 K. W. turbo-generator..........$—————

B. 4,500 H. P. compound reciprocating engine ....$—————

C. 3,000 K. W. engine type alternator....$—————

D. 500 H. P. water tube boiler and superheater ....$—————

E. Stoker or furnace....................$—————

F. Jet condenser for 3,000 K. W. unit.....$—————

G. Surface Condenser for 3,000 K. W. Unit ....$—————

H. 100 K. W. turbo-exciter..............$—————

I. 100 K. W. induction motor exciter.....$—————

J. 150 H. P. exciter engine.............$—————

K. 100 K. W. engine type exciter.......$—————

L. Boiler feed pump for 60,000 lbs. water per hour ....$—————

M. Feed water heater for 60,000 lbs. water per hour ....$—————

N. Piping (see Aggregate Bid No. 4).

SECTION X.

TELEPHONE SYSTEM.

SPECIFICATION X (A-B).

Unit prices on the following equipment in place:

Jack boxes and supports complete, each............$————

Lead covered cables, single twisted pair, No. 16 conductor in place, per lineal foot................$————

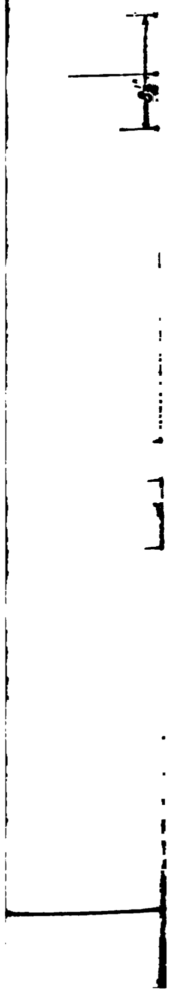
Office switchboard equipment complete as specified..$————

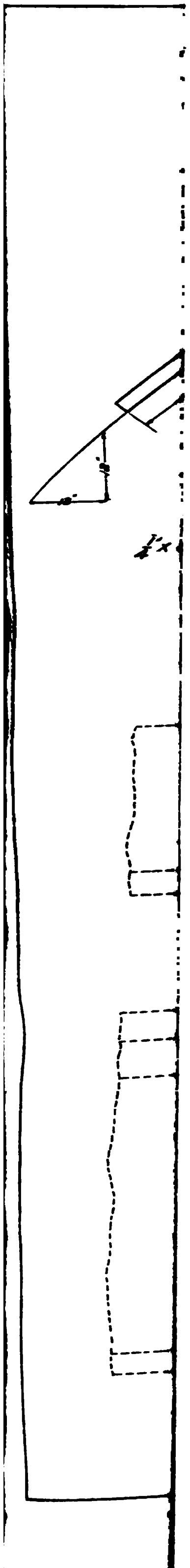
Portable telephones, each.........................$————

(Signed) ....

....

Bidder.

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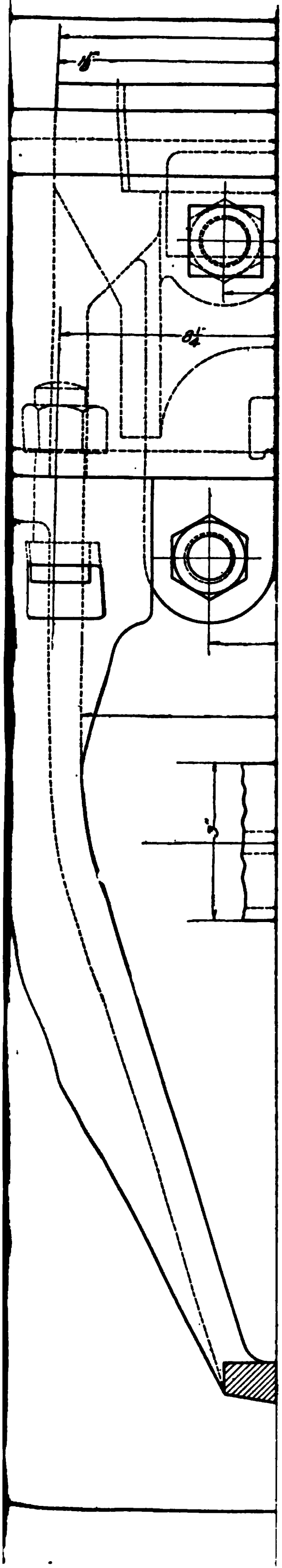
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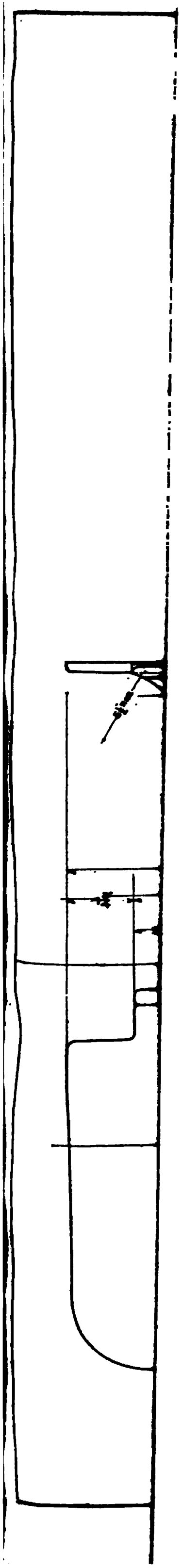

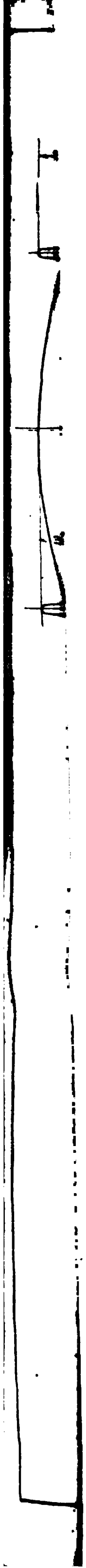

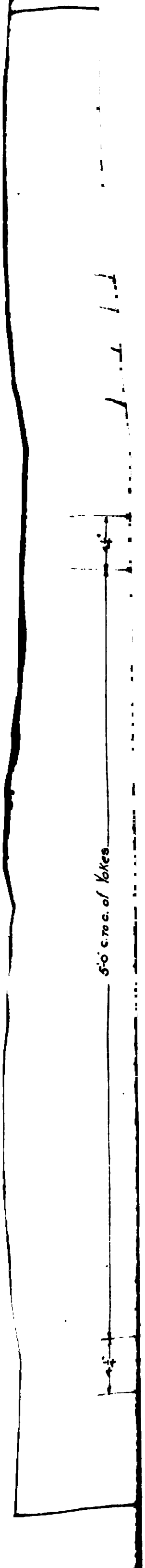
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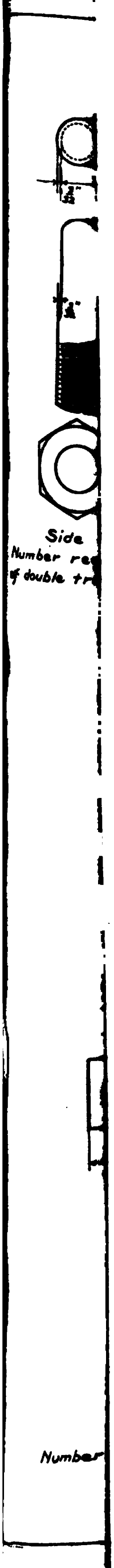
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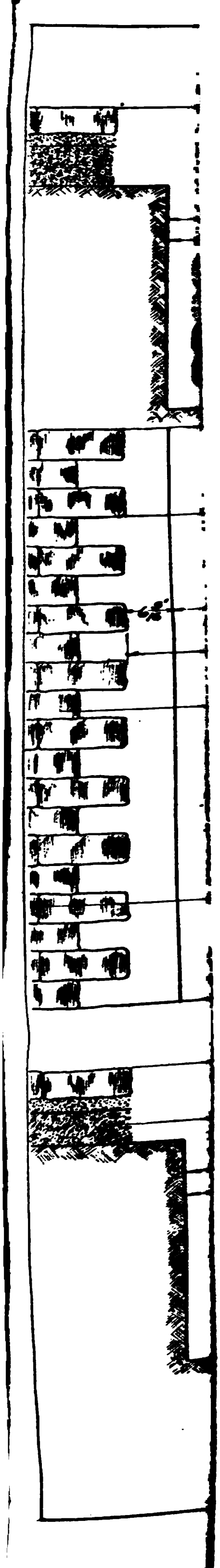

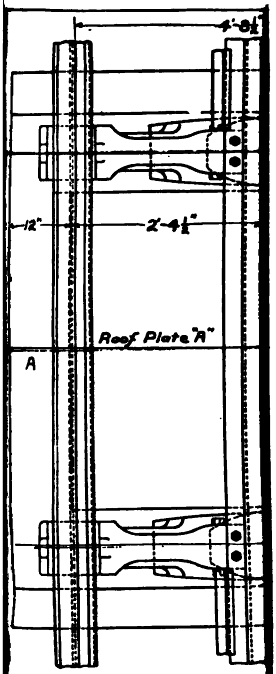
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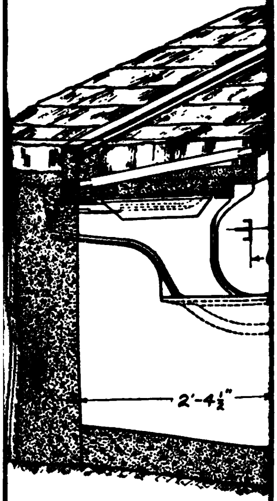
12"
2'-4½"
Roof Plate "A"
A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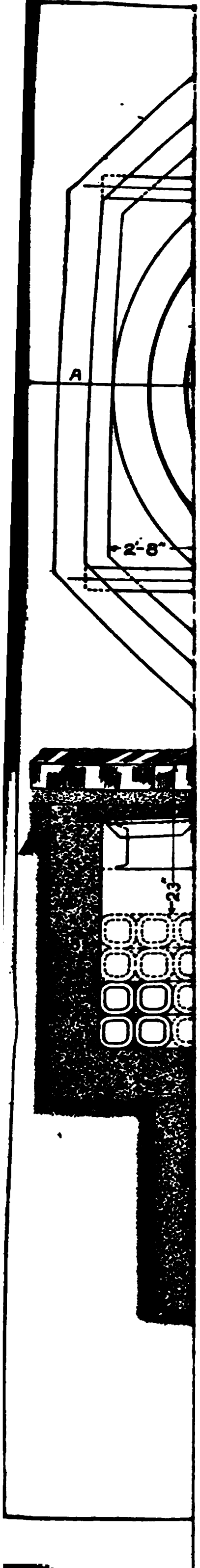
A
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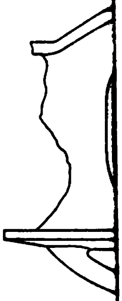
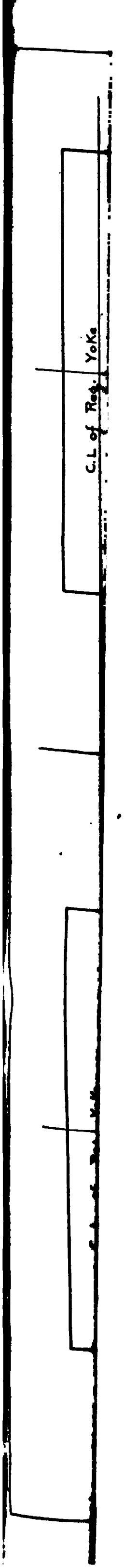
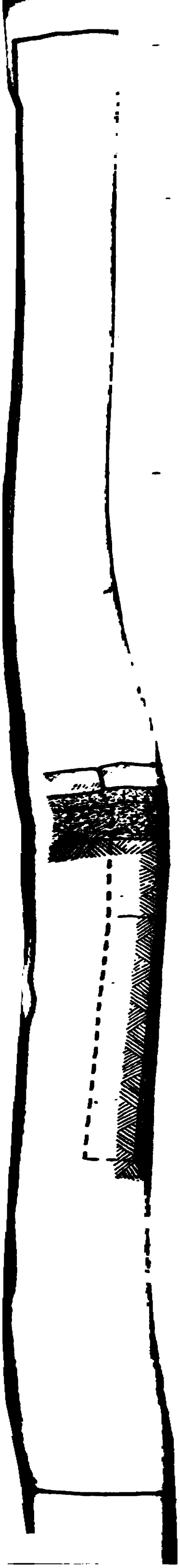
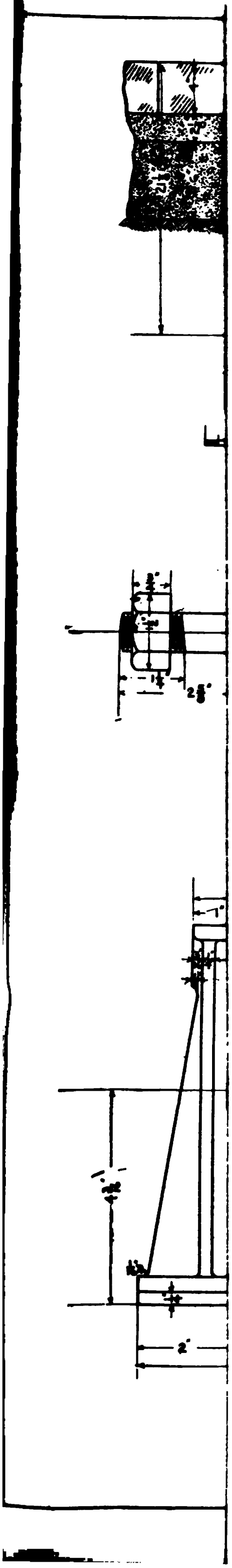
23"





C.L of Reg. Yoke

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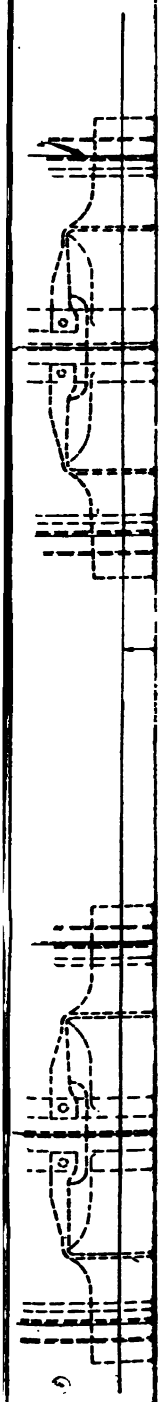

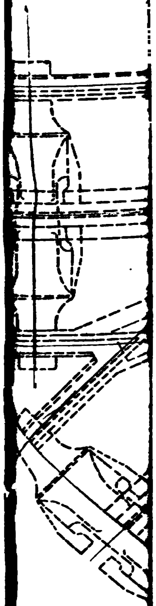

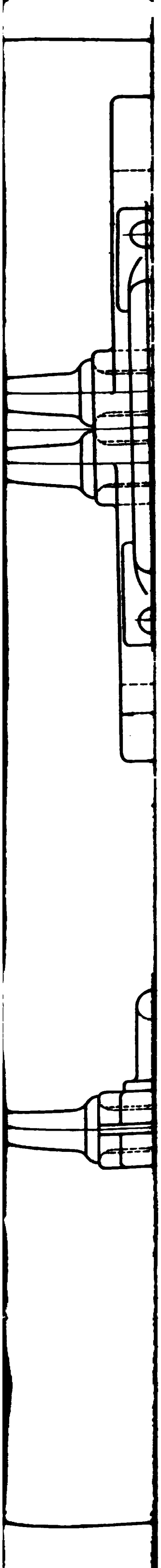

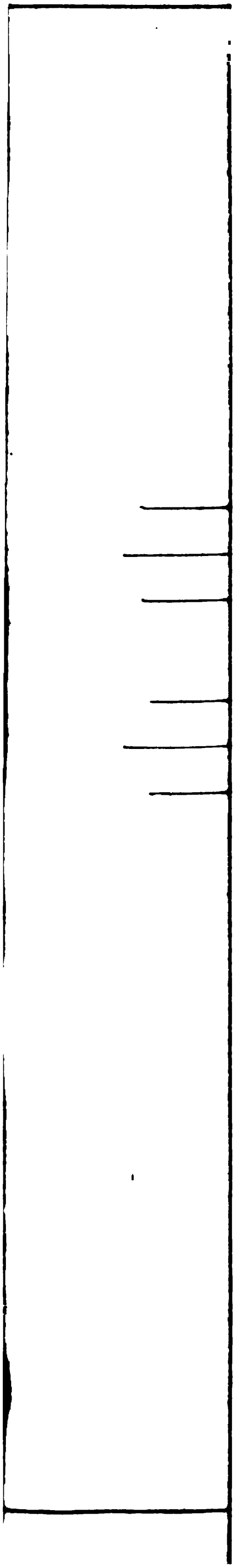

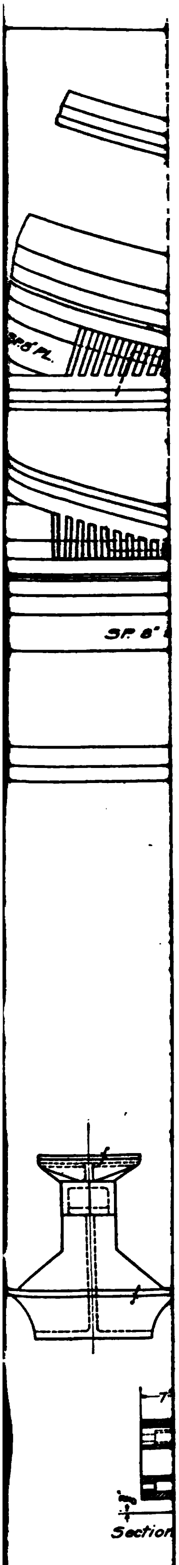
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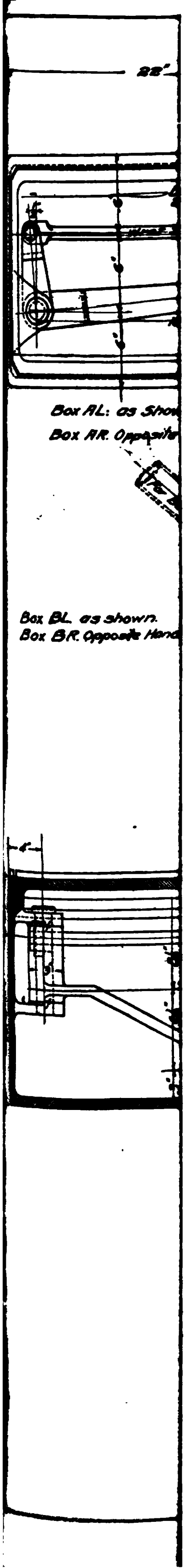
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Box AR. Opposite
Box BL as shown.
Box BR. Opposite Hand
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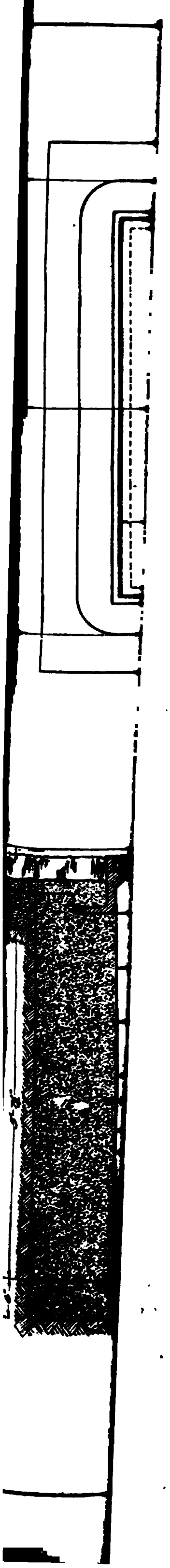
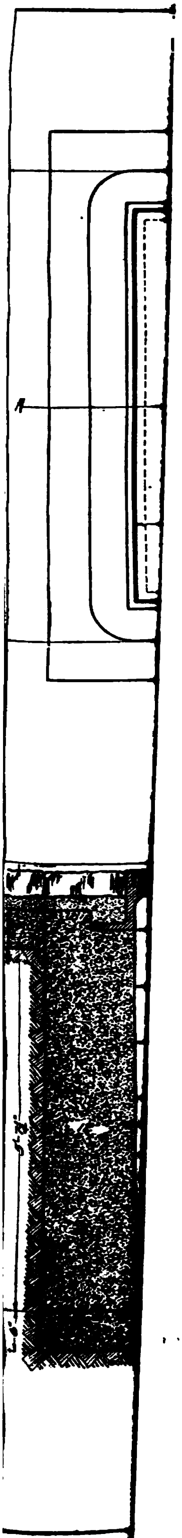
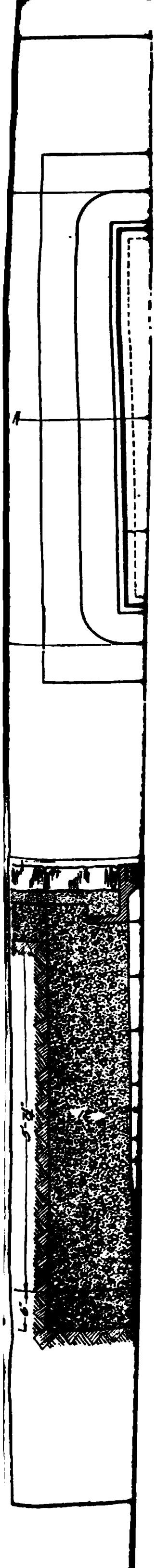
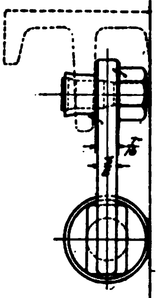
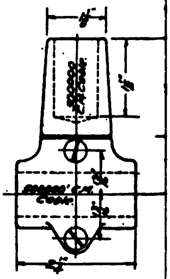


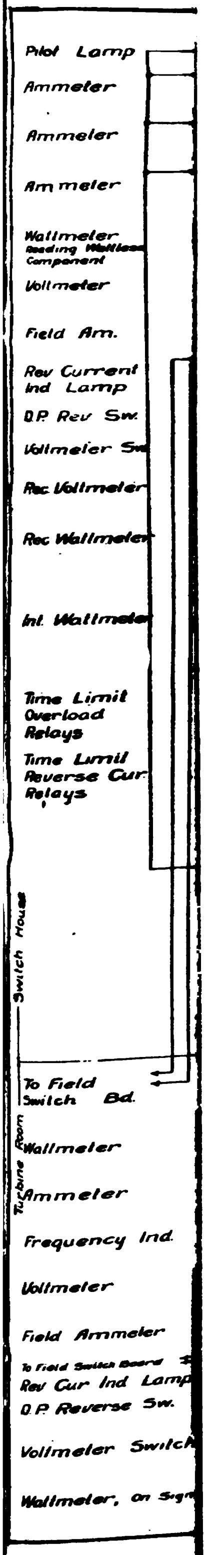


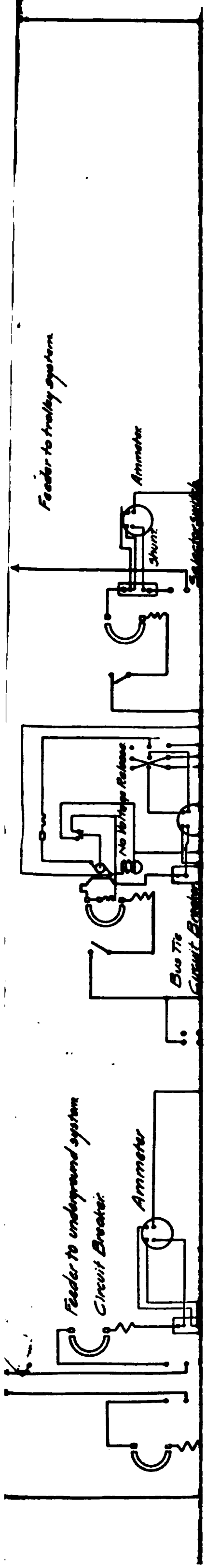

A
5'-2"
1'-6"





Copper. Tee Connector
500000 C.M. Cab


Pilot Lamp
Ammeter
Ammeter
Am meter
Wattmeter
Reading Wattless
Component
Voltmeter
Field Am.
Rev Current
Ind Lamp
D.P. Rev Sw.
Voltmeter Sw
Rec Voltmeter
Rec Wattmeter
Int. Wattmete
Time Limit
Overload
Relays
Time Limit
Reverse Cur.
Relays
Switch House
To Field
Switch Bd.
Turbine Room
Wattmeter
Ammeter
Frequency Ind.
Voltmeter
Field Ammeter
To Field Switch Board
Rev Cur Ind Lamp
D.P. Reverse Sw.
Voltmeter Switc
Wattmeter, on Sig


Feeder to trolley system
Ammeter
Shunt
Selector switch
No Voltage Release
Bus Tie
Circuit Breaker
Feeder to underground system
Circuit Breaker
Ammeter